



COOP'S
SATELLITE
DIGEST



NOVEMBER 15, 1985

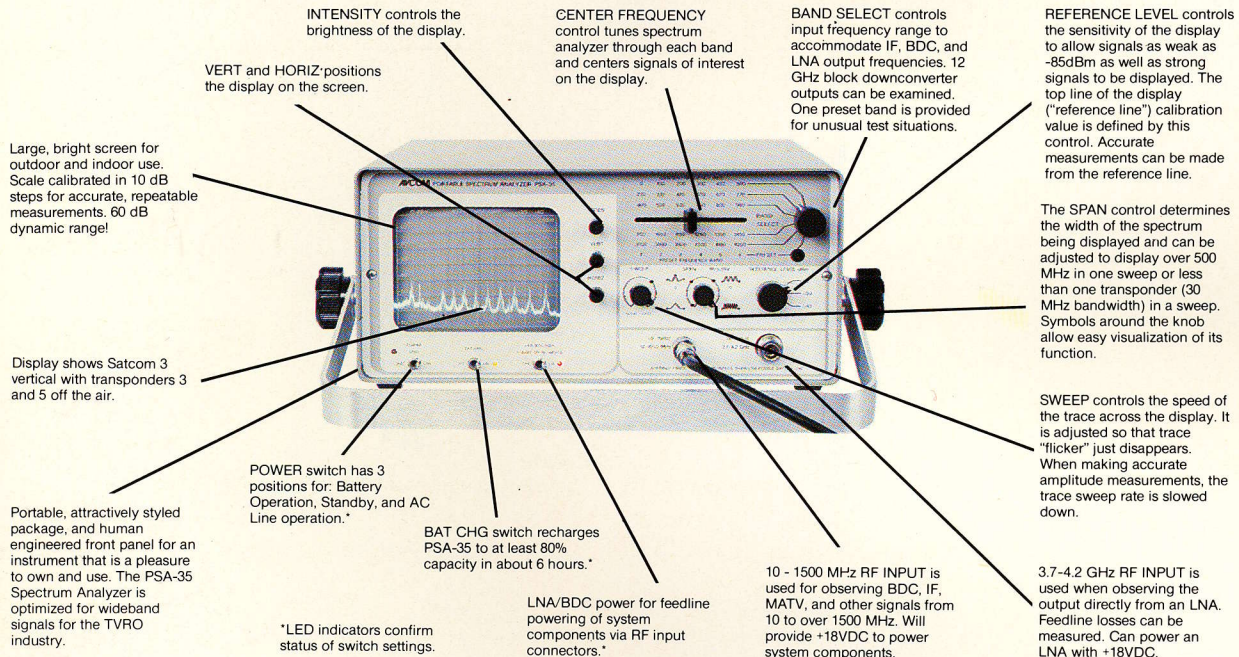
**Brute Force Gain
Industry Standards
Spectrum Analyzers**

AVCOM's PSA-35 Portable Spectrum Analyzer

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Sophisticated enough to grow with!



KEYWORD EXPLANATIONS

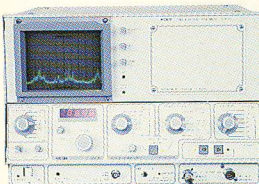
SPECTRUM ANALYZER — an instrument used to display signal amplitude vs. frequency over a selected range of frequencies (bandwidth). Amplitude is shown by the height of the trace on the screen.

REFERENCE LEVEL — in our context, a line at the top of the display that defines signal level at that point. Equally spaced lines below it at 10 dB intervals enable easy readout of various signal levels.

dBm — the most useful unit of measurement of signal strength (power) for our industry. It means decibel referenced to 1/1,000 of a watt of power. The following list will help you put dBm values into perspective:

- +20dBm — 100 mw (1/10 watt)
- +10dBm — 10 mw (1/100 watt)
- 0 dBm — 1 mw (1/1,000 watt)
- 10dBm — .1 mw
- 40 dBm — .0001 mw (typical BDC output)
- 70 dBm — typical 4 GHz feedline signal

FOR DEMANDING BENCH-TEST SITUATIONS, AVCOM'S MSA-85 SPECTRUM ANALYZER



- Digital Frequency Readout
- Accurate Enough for Production and Lab Use
- Built-in DC Block and Power for LNA
- Sophisticated Styling
- Reliable Design

SOME APPLICATIONS

Measure and document TVRO system performance after installation or service. Customer should be given copy of results per AVCOM's SASAR (Spectrum Analyzer System Analysis Report) to insure customer confidence and satisfaction.

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(More applications in our next series of ads — send us yours for publication.)

AVCOM's high performance spectrum analyzers become even more attractive when price is considered. The PSA-35 is \$1965 and the MSA-85 is priced at \$5345. Nothing on the market offers their performance at a comparable price.

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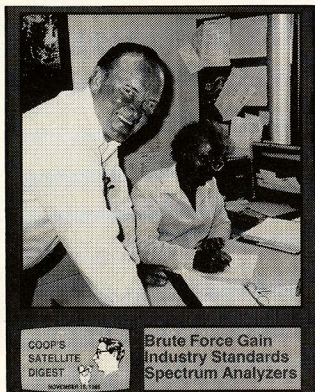
AVCOM's PSA-35

THE MOST VALUABLE TEST INSTRUMENT YOU CAN BUY FOR INSTALLING AND SERVICING TVRO SYSTEMS!!

NOVEMBER 1985

COOP'S SATELLITE DIGEST

OUR COVER/Father and son team, Keith Anderson (forward) and son Mark have propelled a laid-back South Dakota firm into the forefront of home TVRO technology with Keith's innovative designs and a management team consisting of Mark, Allen and August Anderson (Anderson Scientific, Inc., Rapid City, South Dakota).



Succeeding in the TVRO Business 34

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President—Douglas G. Brown

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Christopher J. Schultheiss

Editor

Bob Cooper, Jr.

Assistant Editor

Pat St. Charles

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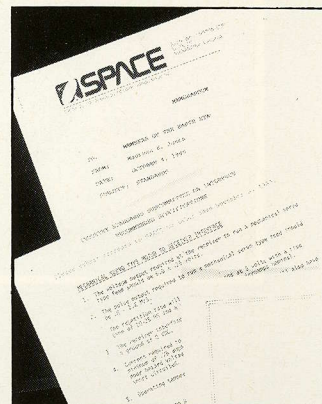
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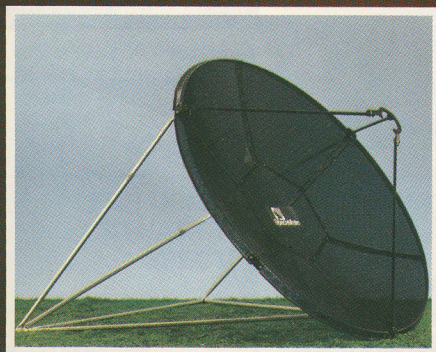
Analyzer 18



Standards 48

Introducing the six-foot dish that's getting great reception. Even from skeptics.

- UPS shippable
- 10-minute assembly
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- Do-it-yourself ease
- Complete & accurate aiming instructions



SpaceMate™ is changing a lot of people's minds about the practicality of a six-foot satellite dish.

Several million dollars have been invested in the design and tooling of SpaceMate — and the result is a dish that, with the proper electronics, provides exceptional video reception from any C-band satellite.

SpaceMate has been engineered for convenience and for maximum consumer acceptance. The seven-piece dish and mount fit into two compact, UPS-shippable boxes. SpaceMate's "see-through" construction and ebony color reduce its visual impact regardless of the surrounding terrain.

And now SpaceMate is available with either a true polar mount or a lightweight, all-aluminum AZ-EL Patio mount that includes easy-to-follow instructions and a highly accurate aiming device for do-it-yourself assembly and aiming (only 10 minutes required). Both mount designs are low-cost and UPS-shippable, so you can offer customers the application that best fits their budgets.

Best of all, SpaceMate is available for immediate delivery.

If you're one of those skeptics who thought you'd never be satisfied with the performance of a six-foot dish, why not get more details, or even a free demonstration? Distributors contact THE STOLLE CORPORATION, a subsidiary of Aluminum Company of America, 1501 Michigan Street, P.O. Box 221, Sidney, OH 45365. Phone: 1-800-556-3203.

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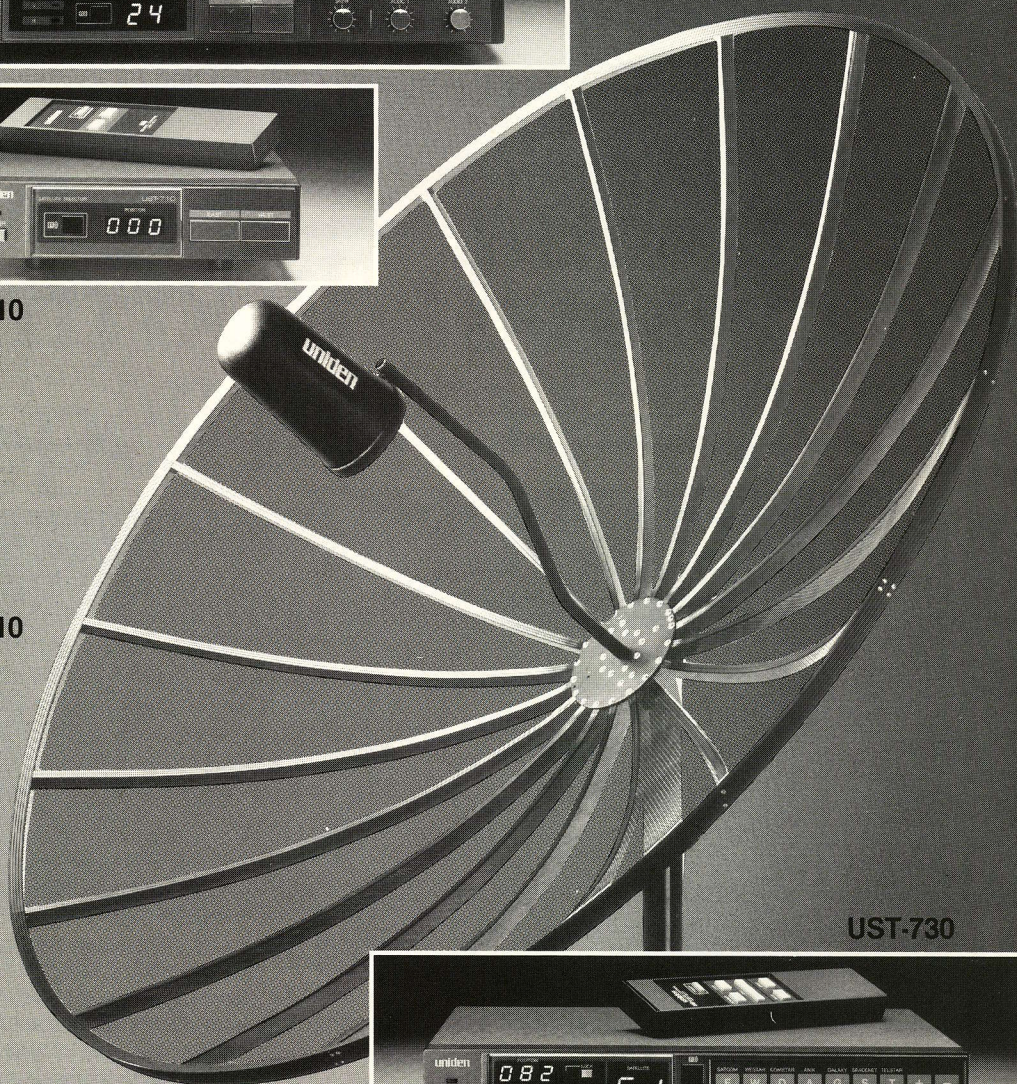


UST-6000



UST-710

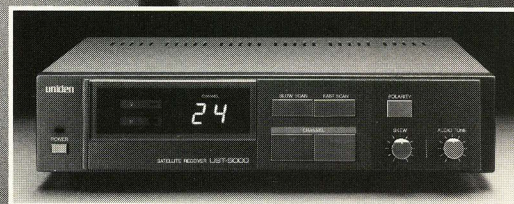
UST-110



UST-730



UST-7000



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COOP'S SATELLITE COMMENT

- NIELSEN Looks At TVRO
- SHOWTIME 'Forced' By HBO?
- SCRAMBLING 'Compromise'?



NIELSEN MEDIA RESEARCH firm is located in Clearwater area of Florida; Rick Towers (shown here) got the contract for their first dish system.

NOW Nielsen

The television 'ratings game' is very unusual and not clearly understood by many. I am one of those who does not understand it clearly. But I thought I should learn more about 'the game' because those people who play the game are learning more about us. Some basic background.

Television commercial time is sold on the basis of audience reach and viewers. A major network program can in theory reach all but perhaps one million US households. So for all practical purposes, most programs properly scheduled in time should universally be available to virtually every American (plus some undetermined number of Canadian, Mexican and other viewers). You might assume that because virtually every network show can be seen by everyone that the cost of a commercial spot in one show would be the same as in another. Of course that is not true.

The popularity or 'rating' for a show becomes the dominant element of influence in any television program. **Potential audience** is not important; **actual audience is**. Therefore the cost or charge for a commercial spot varies from program to program as a function of the anticipated audience for that show.

Anticipating an audience is a dangerous game. What advertisers, who are agreeing to pay premium dollars for premium commercial spots within or adjacent to programs, want to know (indeed, **demand to know**) is, 'how many people will **really** see and hear this commercial?' Short of some sort of instantaneous electronic poll of every single household in America, there is no way to answer that question.

As you might suspect, there are systems in place to 'measure' the

audience of programs. These systems use a sampling technique whereby some small but carefully researched group of 'representative households' are somehow 'polled' for their television viewing habits. One of the measurement systems uses written diaries for measurement. Another uses an in-home electronic gadget which automatically records when a viewer switches channels. The electronic gadget is set up for each household to correspond to that household's cable/off-air channel selection. Switching around, to see what is on, is not recorded; only prolonged viewing.

From 1,200 or a few thousand sampled homes, the various measurement companies can extrapolate the viewing habits for 80 million homes. That seems kind of far fetched, but that is how it is done and more importantly, the people who buy advertising time seem relatively comfortable with the measurement system so there is not intense pressure to develop another one.

There are significant, big dollars involved in all of this. The answer is 'rating points.' Program audiences are rated by 'share' and by 'total home.' At no moment in history are **all** of the television sets **switched on** with people sitting or standing watching the tube. So the total potential audience, a measurement of **all** television equipped homes, is always more than the **actual number** of set-equipped-homes watching television. The total number watching or with their TVs turned on at any moment becomes a more important number ultimately and therefore when the various program services are accorded a 'share' of the total available audience, those shares will never add up (in homes) to as many homes as there actually are out there.



RICK TOWERS (right), Nielsen's Paul Kempter (center) and Coop discuss the Nielsen use of satellite TV.

A 'one-share rating-point' is worth millions of dollars to a TV network and its affiliates, over the course of a few months. If the measure-

COOP/ continued on page 67



Put them both together they spell P-R-O-F-I-T.



There have always been good reasons for selling Uniden antenna controllers with Uniden receivers. Now there's one that's irresistible:

Reduced combination prices for you.

You get them whenever you purchase our UST-710 controller in combination with our UST-5000 receiver, or our UST-730 controller together with our UST-6000 receiver.

Since the recommended retail price of the combination remains unchanged, the discount increases your profits on the single-brand systems your customers prefer...with the single brand that's already number one in the TVRO receiver marketplace: Uniden.

Uniden antenna controllers and receivers look right together, work right together.

The UST-710 is one of the most affordable, accurate and dependable antenna controllers available. It features soft-touch pushbuttons, easy-to-read LED display, and a hand-held remote.

It's an ideal companion for the UST-5000, our basic block downconversion receiver.

Our UST-730 is a fully programmable automatic controller. 9 soft-touch keys for satellite type and another 9 for satellite number yield 81 total programmable positions. Plus, easy-to-read LED displays, memory lock to prevent tampering with programmed positions, and a hand-held remote. It's the perfect partner for our UST-6000

stereo sound receiver with wireless remote control. Purchased together, they come with a holder that conveniently combines the two remote controls into one unit.



Both receiver/controller combinations include our UST-550 block downconverter and our UST-441 LNA, or one of the new Uniden LNBs.

Ask your Uniden distributor or call 317-841-6340 (in Canada 1-800-663-0296) for details about our special receiver/controller prices.

You'll find the combinations make not only dollars, but sense—with improved system performance, desirability and customer confidence.

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Win with Uniden in '85.

PIONEER MEMBER OF
SPACE

Beyond Brute Gain

By Jim Vines

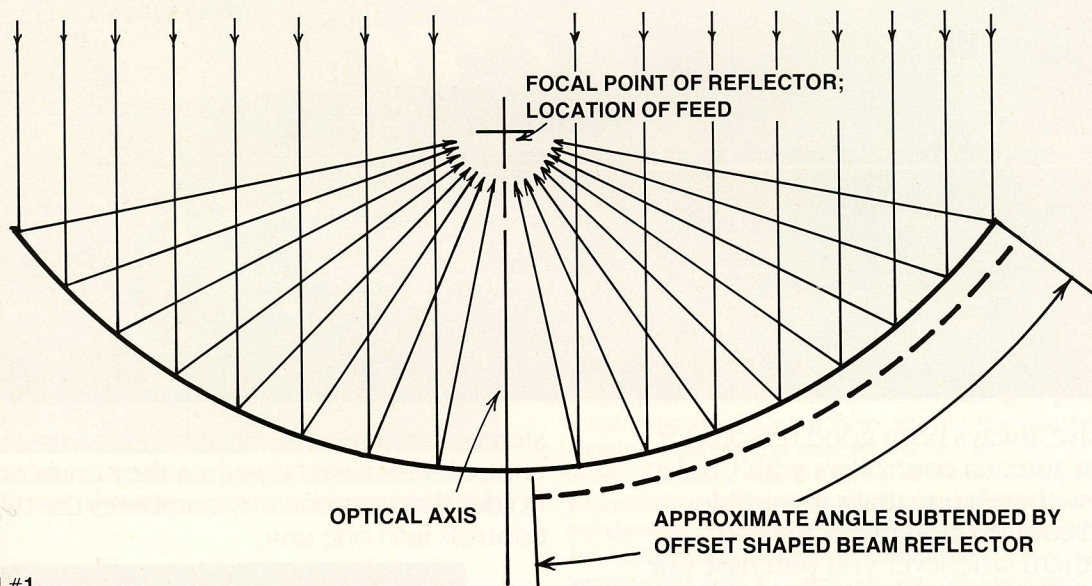


DIAGRAM #1

In **CSD 6/01**, we examined how the application of offset-fed antenna technology allows small antennas to avoid being 'blinded' by adjacent satellite interference as two (or two and one half) degree spacing is implemented across the Clarke Orbital Belt.

By offsetting the reflective surface away from its optical axis (**diagram 1**), neither the feed nor its supports are in a position to interfere with the incoming parallel wavefront.

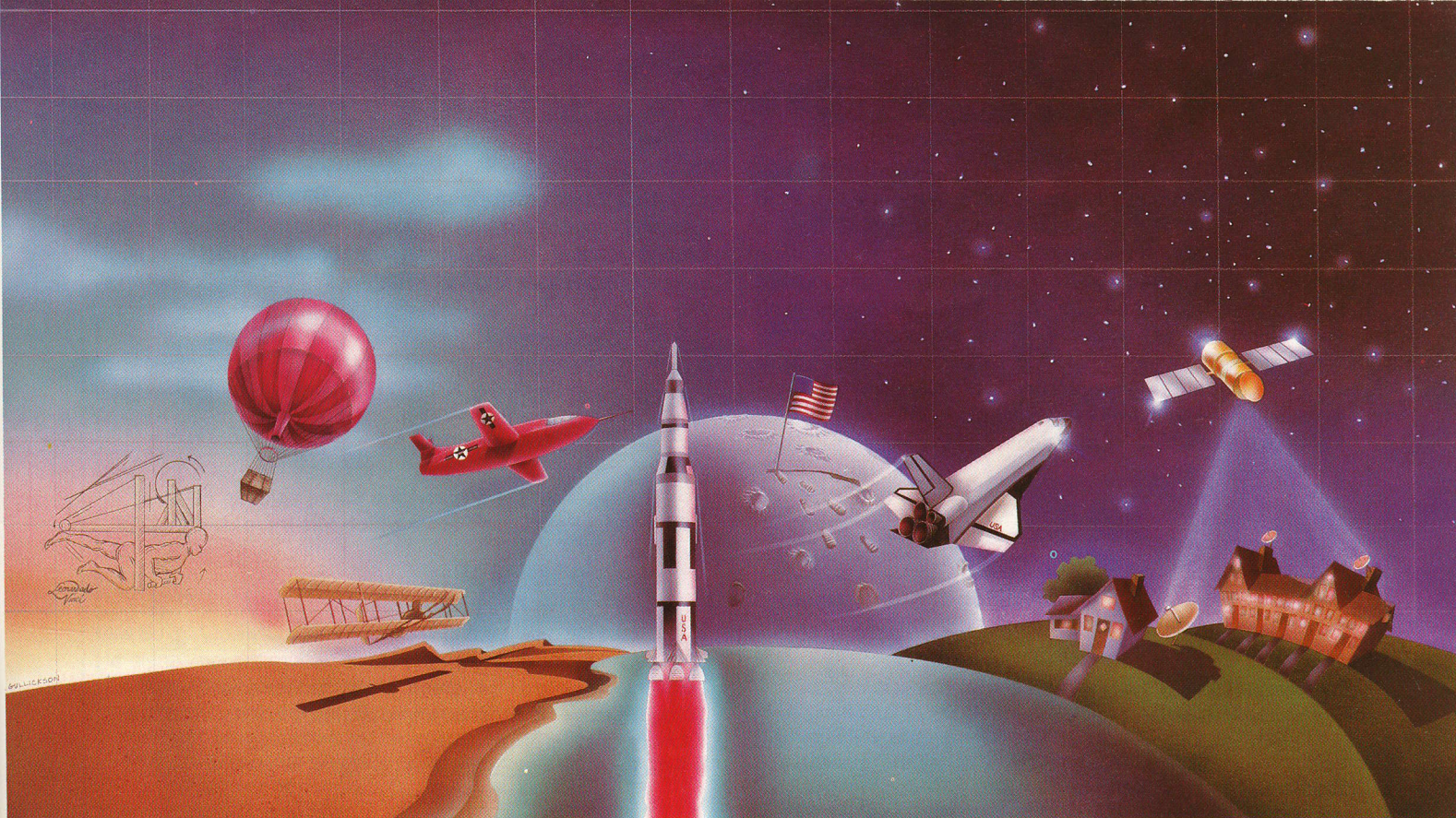
With a perfect reflector surface and nothing in the optical path to block the incoming wavefront evergy, 84 percent of the wavefront energy will be concentrated into the main lobe with the remaining 16 percent winding up in the side lobes. Whether the wavelength is 400 to 700 **nanometers** (visible light) or 7.5 centimeters (4 GHz) an optical instrument that places 84 percent of incoming energy inside of its main lobe is called diffraction limited, meaning that **no more energy** can be pumped into its main lobe.

In a reflecting telescope, the diagonal mirror and its supports disrupt the incoming wavefront, causing **more than 16 percent** of the light to wind up in the sidelobes, which in reality are concentric rings that surround the main lobe. (A range test plot is actually a 'cut' straight through the main lobe. If re-

peated 'cuts' are taken at varying distances off-axis, a three-dimensional picture of the main lobe can be drawn, together with the side lobes surrounding it.)

Similarly, with a conventional TVRO antenna—even one with a 'perfect' surface—the feed and its supports cause more energy to wind up in the side lobes and less energy to wind up in the main lobe. Because of these obstructions the main lobe is broader (less directive) and it doesn't 'stand as tall' above the surrounding side lobes. And because the feed, LNA, and feed supports obstruct a greater percentage of a small dish's 'capture area,' their 'diffraction effects' upon small dish performance are more severe than they are upon the performance of larger dishes.

Assuming equal surface 'capture area' and equal surface accuracy, **an offset antenna will have greater gain and a lower noise temperature.** It is this relationship between antenna gain and antenna noise temperature that is most interesting. Since small home satellite TVRO antennas are more apt than larger antennas to be 'blinded' at low look angles by the Earth's thermal glare, offsetting holds the added promise (through side lobe reduction) of reducing antenna noise temperature.



Echosphere Corp.: Because somebody has to go first.

Going first requires innovative thinking. Taking the risks to turn ideas into reality. Plotting the course for others to follow.

Echosphere Corporation has been the leader in TVRO since the industry's inception. Leadership which has made us the most respected distributor of home satellite products and services in the world. Leadership that is defining the course of the industry.

First with National Distribution

With Echosphere, you get the power of our national distribution network and the thorough understanding of your local market that you'll find at each regional facility.

First in Product Selection

We're a stocking distributor for over 60 manufacturers.

First with Same Day Shipping

Echosphere is the first truly national distributor. Our five locations—Knoxville, Dallas, Denver, Phoenix and Sacramento—allow us to provide normal delivery nationwide in only 48 hours.

First in Competitive Pricing

We buy in large volume and pass the savings on to you.

First in Product Knowledge

Our sales people are knowledgeable professionals, not order-takers.

First in Dealer Support

We provide excellent support with dealer financing, co-op advertising, technical service and dealer training seminars.

First Internationally

With Echosphere International, our commitment doesn't stop at the border.

First in Satellite Development

Antares, our 12 GHz satellite project means a bright future for our dealers.

Become Part of the First Team

The finest products, first-rate service, competitive prices and a commitment to excellence in all we do have made Echosphere the leader in the satellite television industry. Call us today and discover why working with the leader is the fast track to first place.

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The Distributor That Makes A Difference.

The published noise temperature for the 4 x 7 foot **Pico 'KID'** at 5, 10, and 40 degree look angles is 38°K, 27°K, and 18°K, respectively. A six foot dish (About equal in area to the Pico KID's 26.5 square feet) will have a noise temperature of about 180°K, 120°K, and 50°K at the same look angles. In effect, the offset design 'sees a blacker sky' than its conventional cousin. How does this affect 'System G/T?' Time to compare the G/T performance of a pair of neighboring TVRO systems; both are identical in every respect down to antenna size: seven feet. But where 'A' has a conventional antenna, 'B' has an offset.

	"A"	"B"
Antenna Type	Conventional	Offset
Antenna Diameter/Gain	7 ft - 37 dBi	7 ft - 38 dBi
Antenna Noise Temp	@ 5° = 150°K @ 10° = 100°K @ 20° = 65°K @ 40° = 46°K	@ 5° = 38°K @ 10° = 27°K @ 20° = 21°K @ 40° = 18°K
LNA noise temp	80°K	80°K
Other noise sources	5°K	5°K

Now to calculate the G/T 'figure of merit' for **System A** at a look angle of **40 degrees**:

$$\begin{aligned} G/T &= G_{\text{Antenna}} - 10 \log (T_{\text{Antenna}} + T_{\text{LNA}} + T_{\text{Other}}) \\ &= 37.0 \text{ dBi} - 10 \log (46^\circ\text{K} + 80^\circ\text{K} + 5^\circ\text{K}) \\ &= 37.0 - 10 \log (131^\circ\text{K}) \end{aligned}$$

The "10 Log" value of (131°K) is 21.2 so ...

$$G/T = 37.0 - 21.2 = \mathbf{15.8 \text{ dB/K}}$$

Next, calculate receiver CNR for System A:

$$\begin{aligned} \text{CNR} &= \text{EIRP Satellite} + G/T \text{ System} - \text{"Path Loss Factor"} \\ &= 35 \text{ dBw} + 15.8 - 41.46 \end{aligned}$$

Stop—right there. What is 'Path Loss Factor' and why is it '41.46'? Path Loss Factor is an 'accounting number' that varies as a function of look angle and receiver IF bandwidth. **A satellite positioned straight overhead** (90 degrees, possible only at the equator) **is over 3,500 miles closer** than one on the horizon. The added distance results in an additional 1.3 dB of path loss.

So, given a receiver IF bandwidth of 25 MHz (measured at the -3dB points), our **Path Loss Factor** is 41.46. With a 30 MHz IF the '**PLF**' would increase to 42.25. Back to our CNR calculation:

$$\begin{aligned} \text{CNR} &= 35 + 15.8 - 41.46 \\ &= \mathbf{9.34 \text{ dB}} \end{aligned}$$

Assuming a CNR threshold of 9 dB, we are okay (though on thin ice). What about **System B**, with its same-size **offset antenna**?

$$\begin{aligned} G/T \text{ Offset} &= 38.0 \text{ dBi} - 10 \log (18^\circ\text{K} + 80^\circ\text{K} + 5^\circ\text{K}) \\ &= 38.0 \text{ dBi} - 10 \log (103^\circ\text{K}) \\ &= 38.0 \text{ dBi} - 20.1 \text{ (the "10 Log" value for } 103^\circ\text{K)} \\ &= \mathbf{17.9 \text{ dB/K}} \end{aligned}$$

The antennas are the same size, but the final system G/T is a very fat **2.1dB/K better**. The CNR will also be 2.1 dB higher, at 11.46 dB—sufficient to banish lingering sparklies from the hot-test pinks.

This 2.1 dB performance improvement could have been accomplished by increasing the diameter of the conventional antenna by about 20% (and its area by about 44%). But what happens at a **low look** angle of 10 degrees? First, the conventional system (A):

$$\begin{aligned} G/T \text{ Conventional} &= 37.0 \text{ dBi} - 10 \log (100^\circ\text{K} + 80^\circ\text{K} + 5^\circ\text{K}) \\ &= 37.0 - 10 \log (185^\circ\text{K}) \\ &= -37.0 - 22.65 \text{ ("10 Log" Value of } 185^\circ\text{K)} \\ &= \mathbf{14.35 \text{ dB/K}} \end{aligned}$$

The receiver CNR, given the same satellite EIRP of 35 dBw and a Path Loss Factor which has increased to 42.00, will be:

$$\begin{aligned} \text{CNR} &= 35 \text{ dBw} + 14.35 \text{ dB/K} - 42.00 \\ &= \mathbf{7.35 \text{ dB}} \end{aligned}$$

Unless the receiver is truly exceptional, a CNR of 7.35 dB will not be saleable. Up in Bangor, Maine, where the look angle of Galaxy 1 is close to 9 degrees, the expected receiver CNR will range from 7+ to 9+ decibels—not exactly thrilling. What, then, about the 'offset' systems (B)?

$$\begin{aligned} G/T \text{ Offset} &= 38.0 \text{ dBi} - 10 \log (27^\circ\text{K} + 80^\circ\text{K} + 5^\circ\text{K}) \\ &= 38.0 - 10 \log (112^\circ\text{K}) \\ &= 38.0 - 20.5 \text{ (the "10 Log" value for } 112^\circ\text{K)} \\ &= \mathbf{17.5 \text{ dB/K}} \end{aligned}$$

This is a **3 dB/K improvement** in system G/T. One dB is due to increased gain. The other 2+ dB are due to the vastly **lower** (27°K versus 100°K) **antenna** noise temperature.

The CNR improvement—like the G/T improvement—will be up by 3.15 dB to 10.5 dB, with a satellite EIRP of 35 dBw. In Bangor, this small offset TVRO system would render CNRs ranging from about 10.5 to 12.5 dB off of Galaxy 1.

Are the noise temperatures cited for the 7-foot offset antenna achievable? Most assuredly, yes. They have, in fact, been achieved by the smaller 4 x 7 foot Pico 'KID,' whose mid-band gain is 37.0 dBi.

Is the performance gap between conventional and offset dishes really that great? It **can be even greater**. The specs cited for the conventional 7-foot antenna are better than 'typical.' Given the generally improved rim integrity of TVRO antennas in 1985, one can expect about 36.5 dBi gain and somewhat higher noise temperatures than cited in the example. With small sizes, where the performance improvement from offsetting is greatest, it is possible for a **competently** rendered offset design to achieve G/T 'parity' with conventional dishes of 80% more capture area—or about 33% greater diameter.

Note that we said **competently** rendered offset designs. Precision is no less important for offset antennas than for conventional designs. Being asymmetrical, offset antennas—whether rectangular or round—are not as easily 'eyeballed' for precision at the job site.

With all antennas, the feed must be located along the optical axis of a dish to prevent '**coma lobes**.' To take full advantage of the offset design's potential for near-axis adjacent satellite rejection, accurate feed location is essential.

Can materials other than fiberglass be used in offset designs? All materials and construction methods found in conventional antennas are adaptable to offset technology. **Can**

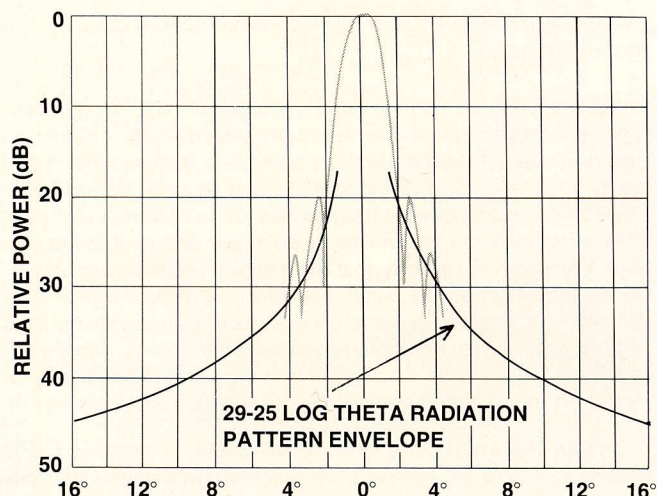


DIAGRAM 2. Idealized plot for a very high quality 10 foot diameter conventional TVRO antenna. Although the main lobe and the first and second side lobes penetrate outside the 29 minus 25 Log Theta 'envelope,' the remainder of the antenna's 'profile,' from about 8 to 180 degrees off boresight, can be fully confined only if the reflector's surface accuracy is very high and if "component optimization" techniques are rigorously applied to both the feed and its support structure.

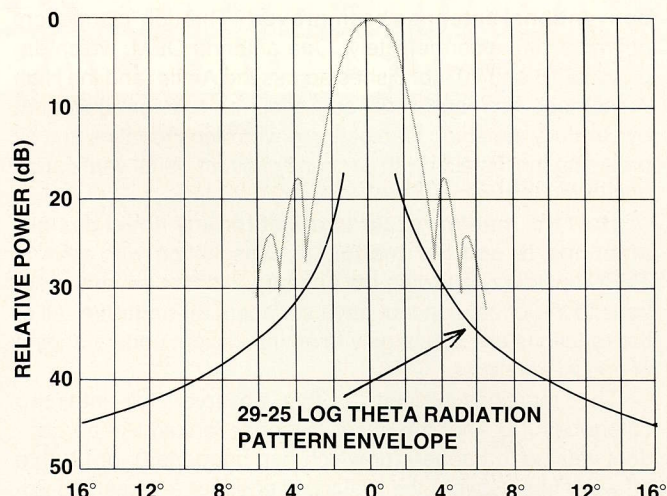


DIAGRAM 3. Idealized plot for a very high quality 7 foot diameter conventional TVRO antenna. Neither the near field nor far field sectors (extending to 180 degrees from boresight) of the antenna's 'profile' will fit within the confines of the 29 minus 25 Log Theta 'envelope.' The practical consequences will be (1) combined adjacent satellite interference as two-degree spacing is widely implemented across the Clarke Orbital Belt, and (2) increased likelihood of the antenna being 'blinded' by off-axis sources of microwave interference such as thermal noise from the Earth and from 'Ma Bell.'

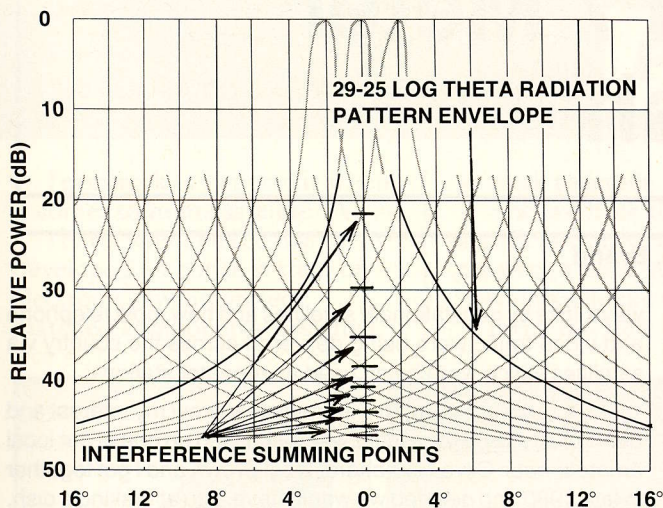


DIAGRAM 4. 'Modulation transfer function' of a theoretical TVRO antenna whose profile has been 'smoothed' to coincide with the FCC's 29-25 Log Theta radiation pattern envelope. The FCC tightened the old '32-25' specification which was adequate for 4 degree satellite spacing requirements. The resulting new '29-25' specification addresses the need for high contrast resolution of satellites spaced just 2 degrees apart. Sidelobe suppression techniques such as offsetting the reflector away from the optical axis will allow antennas smaller than 10 feet in diameter to function satisfactorily in the "dense-packed" satellite environment of the late 1980's. For an antenna to have an ultra-low noise temperature (essential for 'working' with satellites near the horizon) it is essential that it maintain its 'profile' entirely with the '29-25 envelope.'

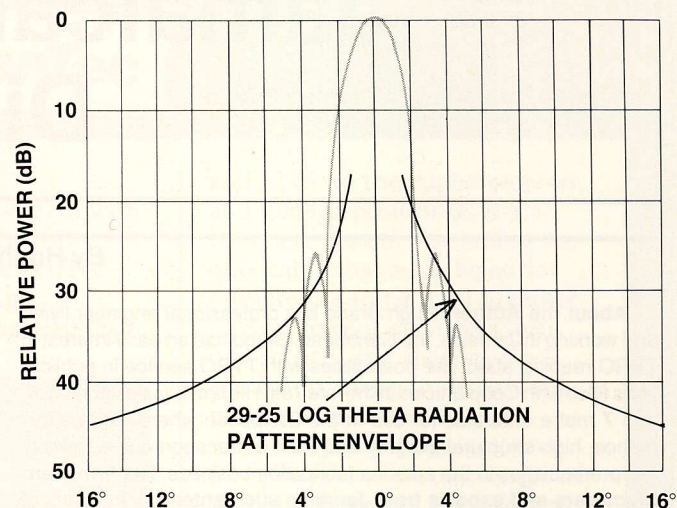


DIAGRAM 5. Idealized plot for a very high quality 7 foot diameter offset TVRO antenna. Other than the very near-to-boresight sector, the antenna's 'profile' is confined within the 29 minus 25 Log Theta 'envelope.' By offsetting the reflector away from its optical axis, the main lobe has been narrowed slightly; but more importantly the antenna's side lobes have been 'dropped off the table.' The practical consequences of this across-the-board improvement in side lobe control go well beyond 'rejection' of combined adjacent satellite interference most notably including vastly superior resistance to 'blinding' by thermal noise from the Earth and 'Ma Bell' microwave interference.

conventional antennas be improved? Through 'component optimization', most definitely. One antenna OEM, which deploys its 16 and 20 foot dishes across the Arctic (and the High Arctic, too), has repeatedly outperformed costlier equipment by carefully matching feed patterns with dish F/d ratios and by providing the installer with a means of direct visual verification of surface accuracy.

How the market reacts to offset (or any novel design) antennas is another matter. In consultation with several TVRO 'insiders' following the Las Vegas show, several reactions to the offset concept have surfaced, **all negative**. All of the reactions are due largely to an insufficient understanding of optical principles.

The reactions voiced to this observer fell into two categories: (1) That the offset antennas looked like an accident waiting to happen (or which had happened), or (2) that offset antennas were the brainchild of either a demented engineer or a cynical marketing director looking for any way to hype sales.

Neither of the above reactions were justified by the facts¹. Still, there is an urgent need for a very thorough and somewhat novel marketing approach if offset (or any other novel design) antennas are to avoid the fate of another func-

tionally superior but narrowly-received consumer concept, the geodesic dome.

1/ Field experience with the PICO Kid antenna has, unfortunately, been poor from a system installer's point of view. Tests in highly demanding heavy TI environments by specialists such as **Peter Sutro** verify Vines' analysis of the **potential** of the antenna. Installers who have tried it report they were not pleased with the assembly/alignment requirements, giving poor marks to the mount and the tracking system. Vines argues, correctly, that the offset fed antenna has great potential for small aperture, small size, low look angle environments. Where the 'theory' and 'practice' seem to have fallen apart in the case of the Pico Kid is with the **implementation** of the practice. There is still a 'winner waiting to be discovered' with the offset fed design challenge. Are there creative antenna mount system builders listening???

About The Author: Jim Vines began building commercial TVRO antennas in 1978, several years ahead of those who would eventually populate America with millions of backyard dishes. Vines holds three patents in the (TVRO) antenna field and his original **Paraframe** design is still being built and installed for Canadian high Arctic sites, where tremendous antenna strength and high surface accuracy are everyday requirements. Vines is recognized as a bit of a 'nut' for tight technical specifications with antenna system designs and he has no love for flimsy antennas that can't handle normal weathering.

Jamaican 7 Meter Dish

By Hugh G. Brand

About the Author: Hugh Brand is a professional engineer living and working in Jamaica, the Caribbean. Brand had an early interest in TVRO reading about the possibilities with TVRO service in publications filled with Coop articles in the late 70s. His firm has designed 5, 6, and 7 metre antennas for use in the Caribbean where high performance, high structural integrity and ease of transport and assembly are prerequisites to the antenna fabrication business. **His firm manufactures and exports from Jamaica such antennas** for users of both private and commercial systems.

His approach to antenna design is 'by the book,' something perhaps 'lost' by many of the current suppliers. In this multiple-part series, he takes the reader through the many calculations required to produce an efficient and effective antenna surface with considerable detail for the mechanical aspects as well. This article was originally presented by Brand to the local Chapter of the IEEE in Jamaica.

PREFACE

This paper represents the results of the experiment and investigation conducted over the past three (3) years ¹ since an interest was taken in satellite television. This first arose in 1979 when I attended a power engineer's conference in the USA. At one of the launches, some of the engineers mentioned how the US had been replacing its land based micro-

wave links by geostationary satellites and how most telephone and video traffic were being delivered across the country via satellites which were being used as repeater stations.

As a radio amateur, this immediately drew my interest and during early 1980 the matter was discussed on one of our local amateur nets. Clive Nembhard, Noel Brown and I got together in late 1980 and decided we would have a go at making a dish. First considered was a spherical dish and indeed a design was made and drawn up. However, we actually made a parabolic dish from which the first pictures were seen Ash Wednesday of 1981. This was a 20 foot diameter steel frame dish with a mesh surface which was later changed to aluminum sheeting because the specific mesh surface required was not available. This unit is still working satisfactorily in Kingston.

Using satellites for communication is, of course, not new to radio amateurs who for years have been putting up and utilizing the **Oscar** type of low orbit satellites for communications. Also large dishes in the earth/moon/earth (EME) type of communications have been constructed for several years by amateurs.

The intention of this paper is to put down most of the relevant facts and experiences so that the non-specialist can try his

¹Paper initially prepared in 1983.

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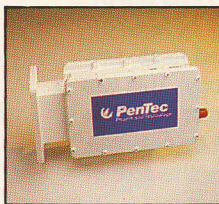
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hand if he wishes, or at least know what it is all about. A great deal of confusion surrounds this subject and no doubt many profit from this ignorance. It is hoped that this paper will remove many mis-conceptions and contribute to the discussions on this very interesting new technology.

The arrangement of the paper is such that all theoretical equations and conclusions are developed in the Appendices which will serve as references for the calculations required for **any size dish** or system being considered. The text will deal with the specific calculation necessary for the dish constructed. As in any new technology, many people contribute something to some section and the writer acknowledges the encouragement and assistance provided by many of his colleagues. In addition, he is indebted to Robert B. Cooper, Jr., (W5KHT) whose writings over the years have contributed a great deal to developing the entrepreneurship of satellite television in the USA, taking it out of the realm of the large corporations and making a new industry in the US. It is hoped that the reader will find the information interesting and provide a desire to go on to further heights.

INTRODUCTION

Although it may be said that the advent of satellite communications began with the launch of Sputnik 1 in 1957, the idea of relay stations in the sky originated many years before, with the famous paper by **Arthur C. Clarke** in **Wireless World Magazine** of 1945. The idea is that if satellites can be placed in an orbit, such that they travel in orbit at the same speed as the Earth rotates on its axis, a satellite will appear stationary to "observers" on earth. Then, since a satellite at this location can "see" over one-third of the Earth's surface, it follows that this would be a more economical way to transfer information across large areas of the Earth's surface. Since this geostationary height, as it is called, is quite large, over 22,000 miles above the Equator, this concept had to await the development of a large launch vehicle with the necessary thrust to put heavy vehicles into space at that height.

The IEEE short course in Satellite Communications, held on August 15 & 16, 1983, by Dr. Durrani went in depth into the methods used and the types of launch vehicles in relation to the international satellite which are now in orbit. We shall confine ourselves with those satellite carrying video which are observable from our area of the earth.

Since all geostationary satellites are located over the equator at 4° or so spacing in longitude then from any position on earth, there will be limits when some satellites will be below the horizon. In fact, the cut off points are somewhat **above the horizon** and Intelsat uses a limit of 5° of elevation, i.e. when their dish is pointed at an elevation of 5°. For less serious work it would not appear practical to deal with this low an elevation angle and 10° is about the reasonable limit. At such low angles the **noise from the Earth** and low atmosphere is enough to degrade the picture considerably.

Appendix 1:3 shows the theoretical basis of electromagnetic propagation. **No new theory is involved here:** this is straight-forward tele-communications technology. This will help to show the derivation of some of the language currently in use in TVRO technology. In particular we shall be calculating **Free Space Loss** and **EIRP** in order to know the size of dishes that we require.

Two (2) important parameters are Carrier-to-Noise Ratio, CNR or C/N and Signal to Noise ratio, SNR or S/N. Typical values for these are indicated below and we shall aim for a CNR of 10; ie. 2dB above threshold and SNR of 48.

Typical Values of CNR, SNR

CNR - Below 6	gives poor quality picture
- 6 - 8	gives marginal reception
- 8 - 10	gives good reception, detail, colour
- above 10	gives very good reception, sharp reception, excellent colour
SNR - 45	VCR quality
- 47	average viewer can perceive noise
- 50	TV broadcast quality
CNR = 8, SNR = 46	FM threshold on most receivers
∴ Aim for CNR = 10 (2 dB above threshold)	
SNR = 48	

Appendix 1:4 derives the C/N, S/N ratios and shows how these are related to EIRP, noise temperature, bandwidth and so on. Here again, no new theories are involved and telecommunication engineers have been accustomed to these concepts for a long time. We shall use the conclusions to calculate the size of dish required to obtain a CNR of 10 from the worst case EIRP on some of the transponders on Satcom F3R, but first let us calculate the free space loss L_s for our location.

Calculation of Free space loss L_s

$$L_s = 32.5 + 20 \log (F) + 20 \log (D)$$

where 32.5 is a constant

F = Frequency in megahertz

D = Slant Range to satellite in kilometers

$$\begin{aligned} L_s &= 32.5 + 20 \log (4000) + 20 \log (38989) \\ &= 32.5 + 72.04 + 91.81 \\ &= 196.35 \text{ dB} \\ \text{Path Loss} &= -196.35 \text{ dB} \end{aligned}$$

We must now determine EIRP for various satellites and transponders and **Appendix 1:5** indicates these calculations for Satcom F3, F4, Westar 5 and **with these figures established**, we can now calculate **the size of dish required** to obtain a CNR of 10 from the EIRP of 26.5 dBW **estimated** for Satcom F3 TR 1 and 21.

Size of Dish required to obtain CNR of 10 from EIRP (worst case) = 26.5 dBW

(Satcom F3 TR 1 and 21)

$$C/N = EIRP + G/T - 43.5$$

$$\therefore 10 = 26.5 + G/T - 43.5 \therefore \log G/T = 27$$

Assume - Antenna noise temperature = 25°K

- LNA noise temperature = 85°K

$$\text{Then } 10 \log (\text{noise}) = 10 \log (85 + 25) = 20.4$$

For figure of merit G/T of 27,

$$\text{Antenna gain} = 27 + 20.4 = 47.6 \text{ dBi}$$

$$\begin{aligned}\text{But Antenna Gain} &= 10 \log [(\pi D/\lambda)^2 n] \\ &= 10 \log [(\pi/\lambda)^2 n D^2] \\ &= 10 \log (\pi/0.025)^2 0.5 + 20 \log D \text{ units (in metres)} \\ &= 29.43 + 20 \log D = 47.6 \\ \therefore 20 \log D &= 18.17 \quad \log D = 0.908 \\ \therefore D &= 8.1\text{m (27 ft)} \\ n &= \text{efficiency (50\%)}\end{aligned}$$

This shows that an 8 meter (27 ft) diameter dish is required to obtain that performance. As we shall see later, if a 7dB threshold receiver and an even lower noise temperature LNA is used, the size dish required **can be** made smaller.

We can now estimate the C/N and S/N for the 7 metre system at York Castle Ave., again using the worst case transponders of Satcom F3.

Estimation of C/N & S/N for 7m System at York Castle Avenue (worst case)

Assumptions

EIRP for Satcom F3 TR 1-21 = 26.5 dBW (Appendix 1:5)

Antenna Noise Temp $T_1 = 25^\circ\text{K}$ for dish elevation of 26°

LNA Noise Temp $T_2 = 100^\circ\text{K}$

Antenna Gain $G_a = 10 \log [(\pi D/\lambda)^2 n]$

where A = Dish aperture

D = Dish diameter

= 7000mm

λ = wavelength at 4 GHz

= 75 mm

n = Efficiency (50%)

$$\begin{aligned}G_a &= 10 \log \left(\frac{\pi \times 7000}{\lambda} \right)^2 \times 0.5 = 10 \log (4.298 \times 10^4) \\ &= 46.3 \text{ dB}\end{aligned}$$

$$\begin{aligned}\text{Figure of merit } G/T &= G_a - 10 \log (T_1 + T_2) \quad \text{Appendix 1:3} \\ &= 46.3 - 10 \log (25 + 100) \\ &= 25.3 \text{ dB/K}\end{aligned}$$

$$\begin{aligned}\text{C/N} &= \text{EIRP} + G/T - 43.5 = 26.5 + 25.3 - 43.5 \\ &= 8.3 - \text{above threshold but below desired margin of 2}\end{aligned}$$

$$\text{S/N} = \text{C/N} + 37.44 = 45.74$$

If LNA Temp **increased** to 85°K ,

$$G/T = 46.3 - 10 \log 110 = 26.0$$

$$\therefore \text{C/N} = 26.5 + 26.0 - 43.5 = 9.0$$

$$\text{S/N} = 9 + 37.4 = 46.4$$

Alternatively

C/N = Equivalent LNA signal input - Equivalent LNA Noise input (in dB) - misc. losses.

$$\begin{aligned}\text{LNA Signal Input} &= \text{EIRP} - \text{Path Loss} + \text{Antenna Gain} \\ &= 26.5 - 196.3 + 46.3 \\ &= 123.5 \text{ dB}\end{aligned}$$

$$\begin{aligned}\text{LNA Noise Input} &= 10 \log [T^\circ (\text{LNA}) + T^\circ (\text{ANT}) \times \text{Boltzman} \\ &\quad \text{Constant} \times \text{IF Noise Bandwidth}] \\ &= 10 \log (125 + 1.381 \times 10^{-23} + 30 \times 10^6) \\ &= 20.97 + (-228.6) + 74.77 \\ &= -132.9 \text{ dB} \\ \therefore \text{CN} &= -123.5 - (-132.9) = 9.4\end{aligned}$$

This shows that with an LNA noise temperature of 100°K , antenna efficiency of 50%, and antenna gain of 46.3 dB we get a figure of merit (G/T) of 25.3dB/K and a C/N of 8.3. This is above threshold but below desirable margin of 2. Use of a lower temperature LNA such as 80 or 70°K would achieve considerably better results as shown:

Appendix 1:6 gives a table of estimated antenna sizes for EIRP at Kingston in order to give an earth station margin over a receiver threshold of 1.5 dB. It must be appreciated that everything is based upon the foot print EIRP, which is an 'estimated' number ². This has been known to vary **widely** from published data and therefore a great deal of this must be taken with caution and any doubt should be taken on the conservative size.

² Perhaps more accurate 'estimates' are now available than were possible in 1983.

Appendix 1:3

FREE SPACE ELECTROMAGNETIC PROPAGATION

Assume satellite transmits signal power of P_t Watts.

If radiated isotropically, power density P_t at distance d metres from satellite would be

$$P_t = P_t / 4\pi d^2 \quad \text{Watts/metre}^2$$

For antennas of the aperture type with aperture area A_t large compared with square of transmit wavelength, λ^2 , it can be shown that maximum gain G_t given by

$$G_t = 4\pi A_t / \lambda^2$$

Power P_r intercepted by receiving antenna is given by product of receiving aperture area, A_r and power density at aperture

$$P_r = P_t A_r = (P_t G_t / 4\pi d^2) \times A_r \text{ watts.}$$

But maximum gain of receiving antenna

$$G_r = 4\pi A_r / \lambda^2$$

$$P_r = (P_t \times G_t \times G_r \lambda^2 / (4\pi d)^2) \text{ watts}$$

Allowing for other losses such as atmospheric, absorption as loss factor L_0

$$P_r = (\lambda / 4\pi d)^2 P_t G_t G_r / L_0$$

In Decibels

$$\begin{aligned}10 \log P_r &= \frac{[20 \log (\lambda / 4\pi d)]}{(\text{Free space loss})} + \frac{[10 \log P_t + 10 \log G_t]}{(\text{EIRP})} \\ &\quad - \frac{[10 \log G_r]}{(\text{Receiver gain})} - \frac{[10 \log L_0]}{(\text{Loss factor})}\end{aligned}$$

10 log P_r - Received power in decibels referenced to one watt - dBW

10 log P_t - Transmitted power in decibels reference to one watt - dBW

10 log G_t - Transmitter Antenna gain above isotropic in dB

10 log G_r - Receiver Antenna gain above isotropic in dB

10 log L_0 - Loss factor in dB

Appendix 1:4

CALCULATION OF C/N, S/N RATIOS

Carrier to noise ratio C/N defined as:

$$\frac{(\text{Low Noise Amplifier Signal Input})}{(\text{Low Noise Amplifier Noise Input})}$$



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In Decibels

$C/N = (LNA \text{ Signal Input (in dBW)}) - (LNA \text{ Noise Input [in dBW]})$

$= (EIRP + \text{Antenna Gain } G_a + \text{Space Loss } L_s - \text{Misc. losses } L_0) - (10 \log (T_1 + T_2) \cdot B \cdot BW)$ where

$EIRP = \text{Effective isotropic radiated power in dBW}$

$T_1 = \text{Antenna Noise Temperature in degrees Kelvin}$

$T_2 = \text{LNA Noise Temperature in degrees Kelvin}$

$B = \text{Boltzman's constant} = 1.381 \times 10^{23}$

$BW = \text{IF Bandwidth of receiver} = 30 \times 10^6 \text{ MHz}$

$= EIRP + [G_a - 10 \log (T_1 + T_2)] - [L_s + L_0 + 10 \log (B \cdot BW)]$

$= EIRP + G/T - \text{constant}$ where

$G/T = \text{Figure of merit for station}$

$= 10 \log (\text{Antenna Gain/Antenna Noise Temp.} + \text{LNA Noise Temp.})$

$L_s = 196.3 \text{ dB}$

$L_0 = \text{Loss due to miscellaneous causes viz:}$

(a) Atmospheric absorption = 0.1 dB

(b) Rain attenuation = 0.2

(c) Aiming error = 0.3

(d) De-polarization = 0.1

(e) Windage = 0.4
1.1 dB

$10 \log (B \cdot BW) = -153.8$

constant = $-(196.24 + 1.1 - 153.8) = 43.5$

$C/N = EIRP + G/T = 43.5$

At or above threshold, television signal to noise ratio S/N , measured at satellite receiver output given by

$S/N = C/N + 20 \log (DFV/FVM) + 10 \log (B/FVM) + EW + 10 \log 6$ where

$DFV = \text{Peak Video Deviation} = 10.7 \text{ MHz}$

$FVM = \text{Top Video Baseband Frequency} = 4.2 \text{ MHz}$

$EW = \text{Improvement due to video emphasis and weighting performed over entire communication path} = 13 \text{ dB}$

$10 \log 6 = \text{Adjustment of noise for RMS measurement} = 7.78 \text{ dB}$

$S/N = C/N + 8.12 + 8.54 + 13 + 7.78$

$S/N = C/N + 37.44 \text{ dB}$

Appendix 1:5

Estimate of EIRP for Various Satellites and Transponders At Kingston, Jamaica

Satcom F3R at Longitude 131°W

Gain at Boresite $G_t = 30.5 \text{ dBi}$. Est. Loss in gain at Lat. 18°N, Long. 76.76°W = -9dBw

For Tr, 3, 7, 11, 15, 19, 23, power level of transmitting TWTA = $P_t = 8.5W$

$= 10 \log (8.5/1) = 9.3 \text{ dBW}$

EIRP at Boresite = $30.5 + 9.3 = 39.8 \text{ dBW}$

EIRP at Kgn. Ja. = $39.8 - 9 = 30.8 \text{ dBW}$

For Tr 4, 8, 12, 16, 20, 24 power level of transmitting TWTA = $5W = 7 \text{ dBW}$

EIRP at Boresite = $30.5 + 7 = 37.5 \text{ dBW}$

EIRP at Kgn. Ja. = $37.5 - 9 = 28.5 \text{ dBW}$

For Tr, 1, 5, 9, 13, 17, 21, power take off for Hawaii = 2dBW

EIRP at Kgn. Ja. = $28.5 - 2 = 26.5 \text{ dBW}$

Note Tr. 2, 6, 10, 14, 18, 22, are in a 'special' category and EIRP at Kingston is several dB below expected.

SATCOM F4 at Longitude 83°W

Gain at Boresite $G_t = 30.8 \text{ dBi}$ Loss in gain at Kgn. Ja. = -10 dB

For Tr 3, 7, 11, 15, 19, 23

EIRP at Boresite = 39.8 dBW

EIRP at Kgn. Ja. = 29.8 dBW

For Tr 1, 5, 9, 13, 17, 21, and 2, 6, 10, 14, 18, 22

EIRP at Boresite = 37.6 dBW

EIRP at Kgn. Ja. = 27.6 dBW

WESTAR 5 Longitude - 123°W

Gain at Boresite $G_t = 31 \text{ dBi}$ loss of gain at Kgn., Ja. = -10 dB

For vertically polarized Tr i.e. 2, 6, 10, 14, 18, 22

EIRP at Boresite = 40 dBW

EIRP at Kgn. Ja. = 30 dBW

For horizontally polarized Tr i.e. 1, 5, 9, 13, 17, 21

Power Take-off for Hawaii = 2dB

EIRP at Boresite = 38 dBW

EIRP at Kgn., Ja. = 28 dBW

Appendix 1:6 ESTIMATION OF ANTENNA SIZE FOR EIRP AT KINGSTON, JAMAICA FOR EARTH STATION MARGIN OF 1.5 dB ABOVE THRESHOLD

Satellite	Transponders	(Est) Foot print EIRP	8 dB CNR Threshold Rec.			7 dB CNR Threshold Rec.		
			LNA Temp. K			LNA Temp. K		
			120	100	80	120	100	80
Satcom F3	3, 9, 11, 15, 19, 23	31	15	14	13	14	13	12
Satcom F3	4, 8, 12, 16 20, 24	29	20	18	16	17	16	15
Satcom F3	1, 5, 9, 13 17, 21	26.5	26	24	23	23	21	19
Westar W5	Even Tr	30	17	16	15	15	14	13
Westar W5	Odd Tr	28	22	20	18	20	18	16
Satcom F4	3, 7, 11, 15 19, 23	30	17	16	15	15	14	13
Satcom F4	1, 5, 9, 13, 17, 21, and 2, 6, 10, 14, 18, 22	28	22	20	18	20	18	16
Spacenet		34	11	10	9	10	9	8

*Footnote: The author neglected to include losses between the TWT output and the transmitting antenna on the satellite. Typical loss (TWT/Antenna) for the Hughes HS 376 configuration is -1.5 dB. If these losses were included EIRP levels would be reduced by 1.5 dB.

Analyzing The Analyzer-Part II

By Hugh G. Brand



THE INNOVATORS/AVCOM's Andy Hatfield (left) with PSA-35 analyzer and TISH-40 feedhorn system, LNB; Luly's Bob Luly with his installer-analyzer during the Nashville trade show this past September. No, Luly is not yet offering 'T-shirts' to promote his own analyzer. Perhaps by Vegas.

WHAT You See

In **CSD** for October (15), we reviewed the basic analyzer units now available to TVRO installers/dealers from Luly Telecommunications and Avcom. Both units are relatively new to TVRO, and they represent the first dedicated-to-TVRO spectrum analyzer test instruments brought out for our industry.

On the surface, the analyzer may seem to be nothing more than a sophisticated 'signal level meter,' with the added advantage that you can simultaneously view the relative carrier or signal levels from two or a dozen (any number) of carriers at the same time. Looks are deceiving.

The 70 MHz type of signal level meters, available to TVRO installers since 1980 or so, read-out the relative carrier level present from a single satellite signal at a time. The 'signal level

meter' found on the front of your TVRO receiver is such a device. The channel displayed is also the channel which the metering circuit responds to. More recently, as **CSD** reviewed earlier this year, BDC type installations required that signal level meters 'sum' all of the individual carriers present within the block downconverted passband and then somehow display the 'sum' of those individual carriers on a meter. With the first system, single channel at 70 MHz, to check the signal level for each of the 24 transponders on a fully loaded bird requires 24 separate readings, and 24 separate adjustments of the receiver. With the second system, there is no way to individually review the signal level of the 24 individual carriers; they are always summed and the display readout always reflects that 'sum.' **The analyzer offers an alternative.**



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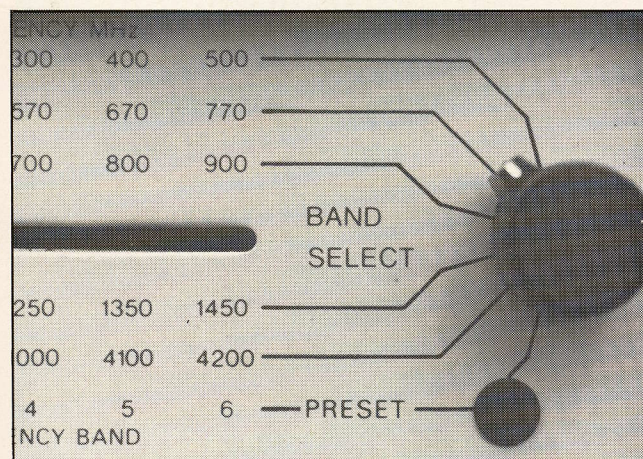
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The spectrum analyzer is a visual display system with the display mechanism being a CRT (cathode ray tube). This is the same type of 'tube' as you find in a small television monitor. The circuits within the analyzer convert the individual channels to a vertical line that appears on the display of the CRT; each vertical line represents a separate, identifiable carrier or transponder.

Adjustments on the front panel of the typical analyzer allow the user to display a wide segment of bandwidth (such as 500 MHz, which corresponds to the bandwidth of the downlinked satellite signals) across the CRT 'face'; or, your choice, a single carrier within the band. This adjustment or control is called 'Span' on the AVCOM PSA-35 analyzer and 'X10' on the Luly unit. Of all the controls normally used by the installer/trouble shooter, this is perhaps the most commonly adjusted control. We'll see why.



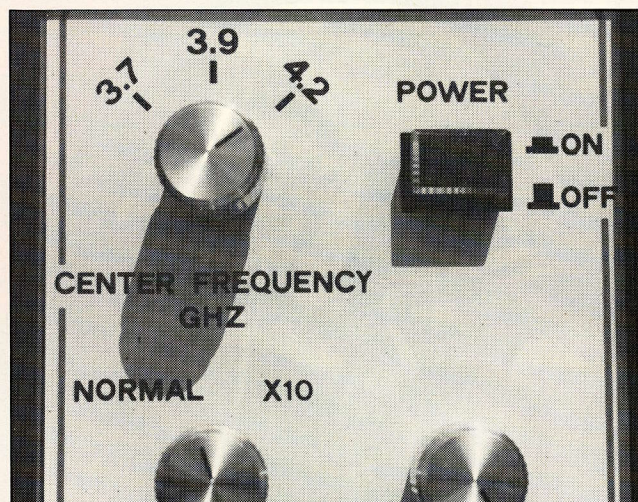
BAND SELECT on PSA-35 is operational control because analyzer has multiple input frequency bands, each 500 MHz wide. See text.

As noted in October, the front panel, or overlay, of the CRT is 'scaled' with 'graticules'; a set of vertical and horizontal lines scribed across a plastic faceplate which become 'calibration' reference points. Typically, the lines running **across the scale** from left to right (right to left) are scaled in dB; at the bottom of the CRT face, you have relatively low(er) level signals or carriers, while those 'blips' that appear on the screen pushing clear to the top of the CRT face are the strong(est) signals. The **up and down**, or vertical, lines represent frequency, with lower frequencies on the left hand side of the display and higher frequencies on the right hand side of the display.

Between the horizontal scribed lines and the vertical scribed lines, the user quickly learns to tell 'how much signal' each carrier represents and 'the approximate frequency' of the signal(s). For most installations, TI checks and equipment testing, those two elements would be considered the most important of all parameters.

FREQUENCY Ranges

The spectrum analyzer is actually a receiver; it receives virtually any transmission mode (i.e. format) over its designed frequency range. It differs from a 'normal' receiver in that it converts the received signals to a unique type of display rather than the familiar TV picture and TV sound we are accustomed to using. Thus, it is actually an 'instrumentation receiver' with

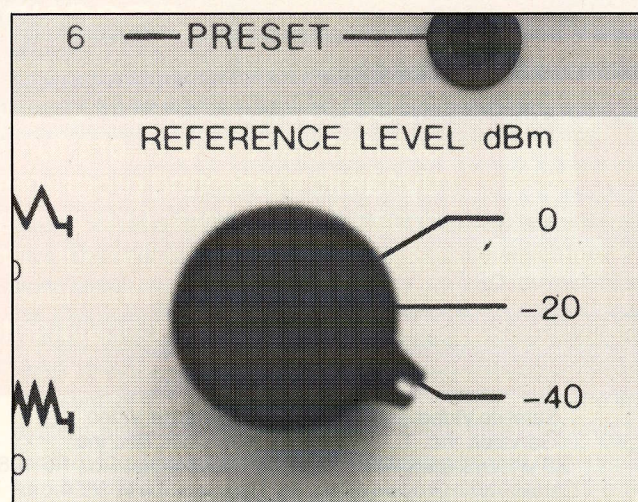


LULY BAND is factory fixed at 430-930 MHz although there is a 'fudge factor' possible to extend it down to 400 and up to 950 in operator controls. Center frequency knob is for narrowed display centering.

its own unique method of display and an internally calibrated system of each of the two most important display functions: frequency and amplitude (ie. signal strength). You should keep this 'basic design criteria' in mind when you ponder the net-to-you selling price of an analyzer.

For a certain sum of money, you can purchase a spectrum analyzer or analyzer system which will cover virtually any frequency range intended; from 'DC' (ie. no frequency) clear up to 220 GHz (220,000 megahertz). As you might suspect, such a 'receiver' is not only expensive, it is also broken down into separate sub-receivers which individually 'cover' or 'tune' only **a portion** of the entire spectrum.

The frequency range of an analyzer for TVRO applications would ideally be such that we cover (1) the input signal frequency region of 3.7 to 4.2 GHz, and, (2) the typical system IF ranges found. As readers are well aware, there are several



INPUT signal level range on PSA-35 is user adjustable over three 'windows'; top CRT reference line is 0 dBm, -20 dBm, or -40 dBm with 60 dBm dynamic range. Luly unit has 10 dBm 'range' for reference line adjustment.

'typical' IF (intermediate frequency) ranges in use in TVRO and, at this point in time, there are no clear cut trends which will tell us that one or another of these individually chosen IF 'ranges' will ultimately be the **only IF range** in use in modern receiver design.

The wider the frequency range covered by the analyzer, the greater the cost of the analyzer. The reason is simple; any receiver that covers several frequency 'bands' typically costs more than a single band receiver. Why?

Each band requires its own set of tuning and amplification circuits. Switching between bands requires a switching network and a balancing network, to insure that when the user 'switches bands' the relative amplitude and frequency accuracy between the bands stays the same on the display.

Luly has taken the approach that his relatively low-priced analyzer (under \$1,000 dealer net) will be most useful in the BDC type of system configuration. In other words, useful to install and troubleshoot systems which all share a common IF range. Even here, however, Luly has been forced to make a decision, since there are several 'BDC bands' in use and, at this time, there is no indication that one of the now-chosen bands will prevail and the others will disappear. Luly has chosen the **430-930 MHz range** for its IF, or input frequency, range. However, as we will see, that is not such a 'confining choice' as you might suspect at first consideration.

AVCOM has taken a broader view of the application with the PSA-35 analyzer and has selected **six separate bands** for user coverage. Five of these are 'stock' and determined by the factory and design; the sixth is up to the user to select, as we shall see.

AMPLITUDE Range

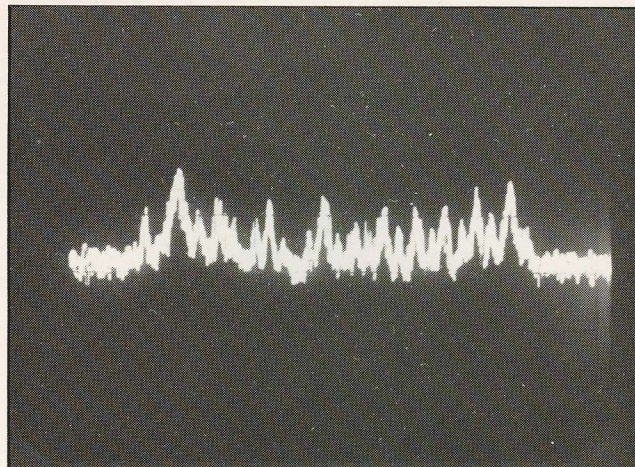
The amplitude, or amount of signal delivered to the unit for display, was our second consideration. Obviously, like any receiver:

- A) Too much signal (such as directly connecting to the output of a transmitter) might harm the sensitive receiver circuits, and,
- B) Too little signal would result in a very weak (or no) display. There is a 'threshold' apparent here as well.

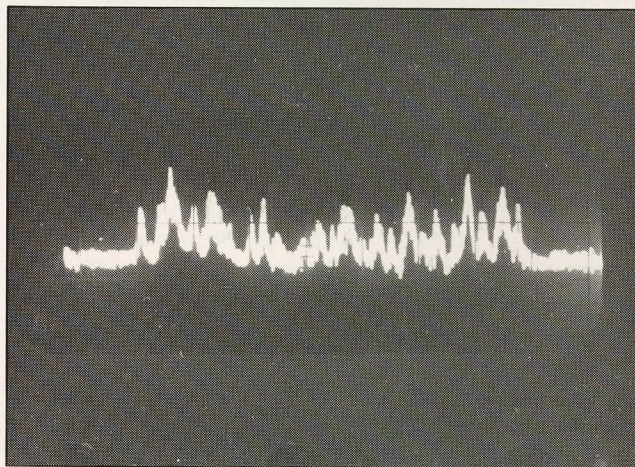
The Luly unit suggests that the input signal from the antenna, or other pre-analyzer sensing and pickup device, be in the region of -30 dBm to -80 dBm. This is a voltage level range which is compatible with virtually all normal TVRO receiving applications/the kind of 'voltage level' you would expect to encounter at the output from a downconverter or LNB, for example.

The AVCOM PSA-35 front screen scribed graticule has a 'reference' signal line across the very **top** of the screen. On the front panel of the unit, there is a three position operator control selection knob labeled 0 dBm, -20 dBm, and -40 dBm. Inside of the PSA-35 is an electronic gain circuit which establishes the 'depth' of the display. This is called 'dynamic range,' and in the case of the PSA-35, the dynamic range is 60 dB. What does that mean?

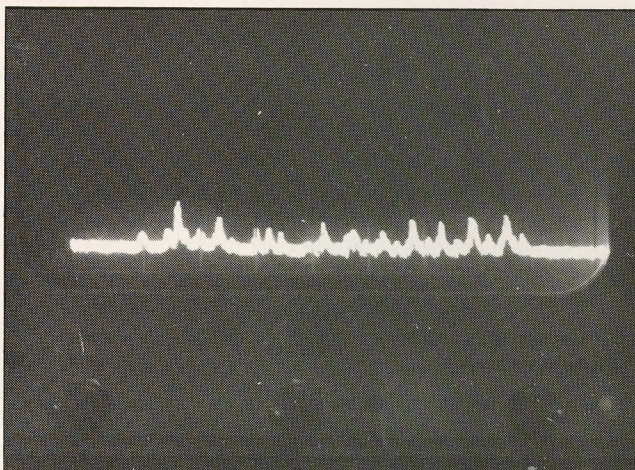
If you have selected the 0 dBm 'reference line' with the front panel selection control, any signal rising all the way to that line on the display screen would be at a signal level of '0 dBm.' At the same time, a signal that is barely visible at the very bottom of the CRT display, hovering just in the system 'noise' (or



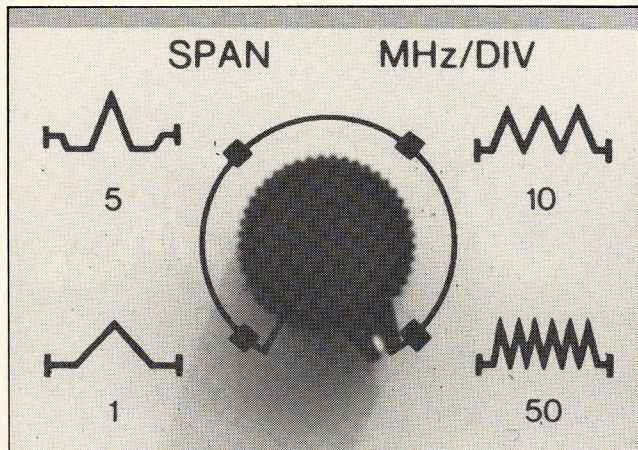
- 40 dBm display on PSA-35 shows maximum unit sensitivity with the bottom of the display now - 100 dBm.



- 20 dBm display with PSA-35 lowers display line on screen (not apparent here, perhaps) and also reduces 'floor' of sensitivity to approximately - 80 dBm. There are 10 active transponders in this display; can you pick them out? 'No problem' after part 3 next month!



0 dBm display on PSA-35 seems to reduce individual spike height which is what it does to correspond to showing the transponder carriers down closer to the bottom of the display 'window' (- 60 dBm in this instance). This is still the same satellite and there are still 10 video transponders present.



'SPAN' is a calibration point with PSA-35; each up and down graticule (vertical) represents a frequency 'division' from the next adjacent graticule mark(s). PSA-35 calibrates knob so that as knob is turned individual graticule marks become 50, 10, 5, and 1 MHz 'apart' (as knob rotates counter-clockwise).

'grass' as it is called in a display), would be 60 dB weaker than the reference line. Thus, the dB difference from the top of the screen to the bottom of the screen is 60 dB; hence, 'dynamic range.'

In the -20 dBm top reference line position, a to-the-top-of-screen display would be -20 dBm 'strong,' while a bottom-of-display signal would be 60 dB weaker (-20 minus 60 = -80 dBm). In the -40 dBm top reference line position, the top of screen signal would be -40 dBm 'strong' while a baseline weak signal would be only -100 dBm.

Luly, perhaps as a part of keeping operations very simple and shoving unit cost down, provides a linear tuning knob which covers the range of -30 dBm (for top of scale) to -40 dBm (also top of scale). With a dynamic range of approximately 40 dB, the Luly unit's on-screen window then becomes 50 dB. That means any signal level between -80 dBm and -30 dBm will 'stay on screen.'

SPAN and Spread

Remember that the analyzer is virtually opaque to the transmission mode; it does not care (nor change operating habits) when a signal being received switches abruptly from FM to AM, or any of the many other (PCM, etc) modulation formats one is likely to encounter in TVRO work. Yes, there are different 'visual signatures' for different types of modulation, as we shall see next month. But the operation of the analyzer is disrespectful of the format and it will 'display' on the CRT any format of signal.

FM, or frequency modulation, signals are the most common format encountered in TVRO work; the video signals we receive and install equipment for are FM. In an FM system, there is a constant variation in the frequency of the actual transmitted signal as the **content** of the video (picture) and audio (sound) changes. A static color bar pattern and a single audio tone will come close to 'standing still' in the frequency deviation department, but any type of **programming** will have a constantly moving 'frequency' for both the apparent video carrier and the attached audio subcarriers. This means that the display you are watching on the screen, depicting the fre-

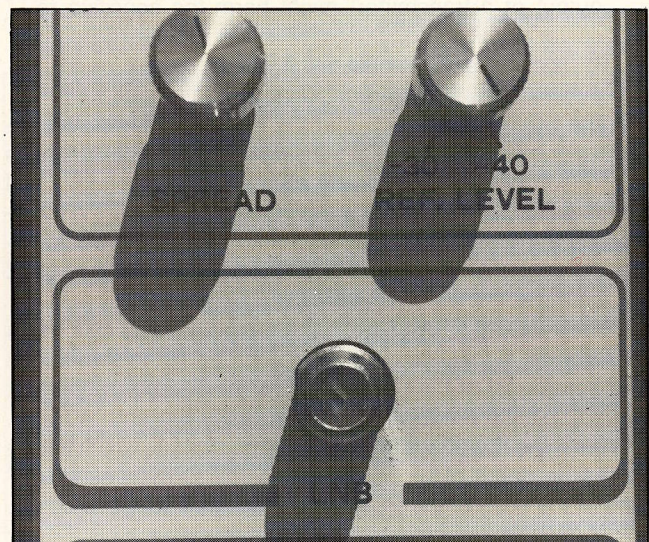
quency and amplitude of the received signal(s), will also be constantly moving.

AM or amplitude modulated signals, have a stable frequency and a relatively stable 'carrier level'; the modulation, or intelligence, superimposed onto the carrier proper is varied as a function of strength of the modulating signal. Therefore, on an analyzer display, the 'AM signals' **stand still**, while the 'FM signals' **dance around**. As you might imagine, accurate measurement of precise signal level and precise frequency is quite a trick when the object being measured is moving all of the time!

Enter the span, or X10, controls. This is an electronic control that allows the user to select a single segment of the spectrum (remember, in the 'normal mode' both of the units discussed here spread a 500 MHz 'spectrum' out on the display screen). **An Analogy:** Say you have a TVRO receiver capable of tuning in all 24 channels at once and then making 24 separate postage-stamp sized displays on the screen; each a different channel. You could watch it okay, but at best it would be a technical curiosity of little commercial value. By selecting just one of those channels and 'blowing it up' until it occupied the full screen, you could now enjoy the programming material without distractions.

The span, or X10, control does something like that; by adjusting it, you 'blow up' on the screen just a single carrier or transponder. Now you not only have an 'enlarged' display of the desired signal, but you also have eliminated the 'clutter' of the other signals as well. This means you can study, analyze, and make intelligent decisions concerning that **single transponder**. Both the Luly and the AVCOM units have this feature although, once again, there are operational differences.

Remember that a spectrum analyzer is an all-mode receiver. It is sometimes convenient to forget this fact. However, any receiver has a 'resolution,' or 'bandwidth,' ability; someplace in the system, it decides just how wide or, in this case, just how narrow a carrier it will 'resolve' on the screen. Re-



'SPREAD' with Luly unit is actually center frequency adjustment allowing user to recenter the particular segment of the band he wishes to inspect 'in detail.' An 'X10' electronic magnification system reduces the full CRT width from 500 to 50 MHz and the user selects which 50 MHz with the spread/center frequency control.

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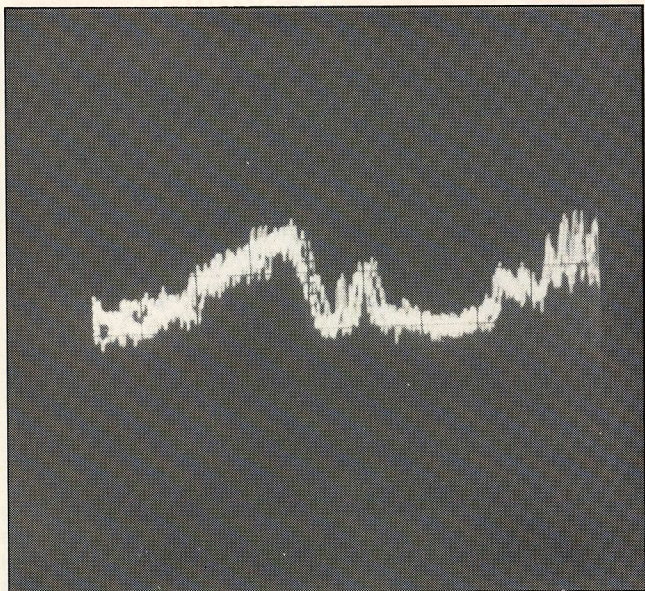
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SLIGHTLY offset 500 MHz display has non-satellite band frequencies apparent on right hand edge with 9 transponders visible to left (PSA-35 display).

member that some carriers are very 'wide,' while others are quite narrow/a function of how they are modulated and how 'hard' they are modulated.

Unless you are willing to spend upwards of \$20,000 (quite a bit upwards, at that), you will not be able to 'see,' or 'resolve,' the very narrow signals with an analyzer. They are simply 'lost' in the 'sidebands' from the wider and often stronger signals.

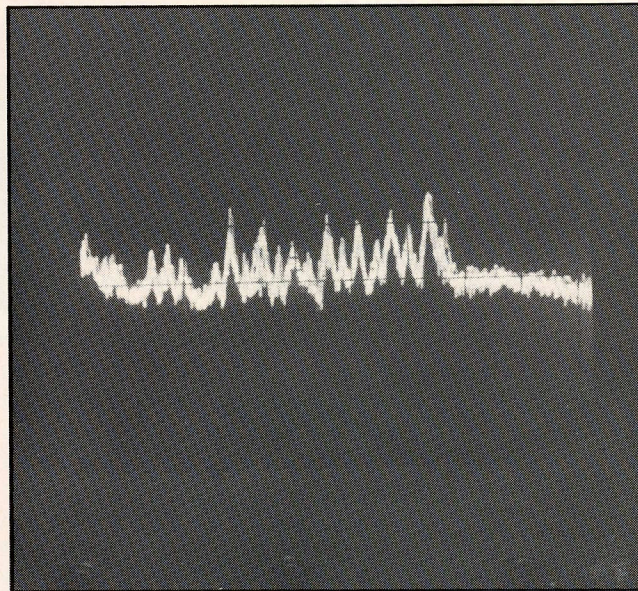
Close-in resolution for TVRO applications is seldom a requirement for the installer or troubleshooter. Even those dreaded 'TI' (terrestrial interference) signals are quite precisely spaced away from the actual carrier frequency of the downlinked satellite signals (typically 10 MHz), so in virtually all of our normal applications, if the analyzer can 'resolve' signals that are 10 MHz apart, you will have no difficulty spotting TI and other unwanted signals on the CRT. The span, or X10, control helps here.

With the respective controls adjusted, rather than having a 500 MHz wide display across the screen, you have a display which can be as narrow as 50 MHz in CRT width (Luly) or 10 MHz in CRT width (AVCOM).

With the Luly instrument, you have a 'normal' and x10 (times 10) switch. In the normal position, the CRT is displaying all 500 MHz of the display width. In the X10 selection, the display enlarges so that **50 MHz now fills the full screen**. A secondary control, center frequency, can now be adjusted to select 'which 50 MHz' of spectrum you wish to view in the 'enlarged' format.

With the AVCOM instrument, a more conventional (to analyzer design) approach is followed:

- 1) The user selects the band and the display comes up with the span control set for maximum width.
- 2) A 'horizontal' centering control now moves the display left and right on the screen so that you can place a single carrier/transponder or band segment in the very **center** of the CRT screen.



CHANGING SPAN control so that display has approximately 5 MHz per vertical division, the individual component parts of a single transponder signal (video carrier plus audio subcarriers) are apparent. Adjacent transponder also appears along right hand edge.

- 3) Now the Span control is adjusted counter clockwise, to spread out the display for closer inspection of the selected band portion.

The AVCOM has a measure of 'tunability' which the Luly does not have. In selecting the input frequency (range) desired, there is another way, as well, to accomplish the same thing with the AVCOM. The bottom line, however, is that you end up with about the same 'control' of the display proper with either the AVCOM or Luly. The AVCOM does it slightly more elegantly, and because of its ability to resolve carriers, which happen to be quite close together, the definition or detail of the AVCOM display will be significantly better for closely spaced carriers than with the Luly unit. (Remember, however, for the majority of TVRO work, the Luly units resolution will be adequate).

Powering

Most analyzers available for field work in all fields of communications now provide their own internal (rechargeable) battery supplies. An analyzer that must be attached to 110 VAC to function is obviously not much good in the field. The Luly unit uses a set of (Nicad) rechargeable batteries which power the unit proper.

The AVCOM unit also has internal rechargeable batteries, **as well as** its own internal 117 VAC power supply. The charger for the PSA-35 is **built-in**; a front panel switch allows the user to select either 117 VAC powering, internal battery powering, or tell the internal batteries to recharge from the 117 VAC line. The Luly unit comes with a small external 12 VDC charger which will not supply adequate current for real-time (117 VAC) operation. Under load, the current capacity of the small charger simply will not handle the drain of the operating unit.

Both Luly and AVCOM's Hatfield recognized that one of the

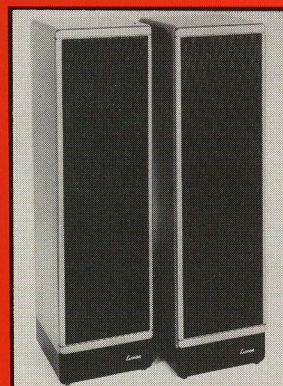
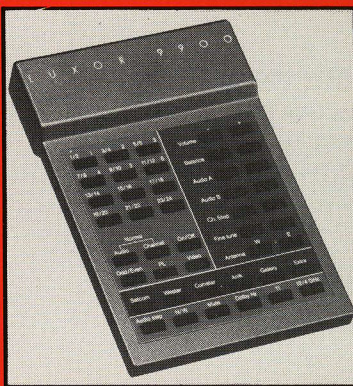
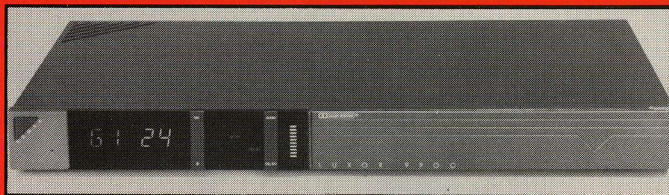
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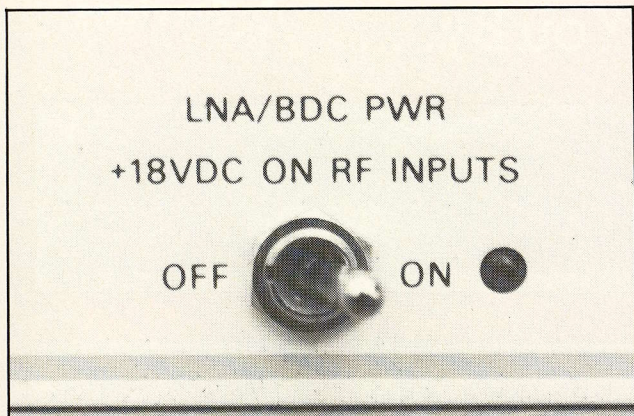
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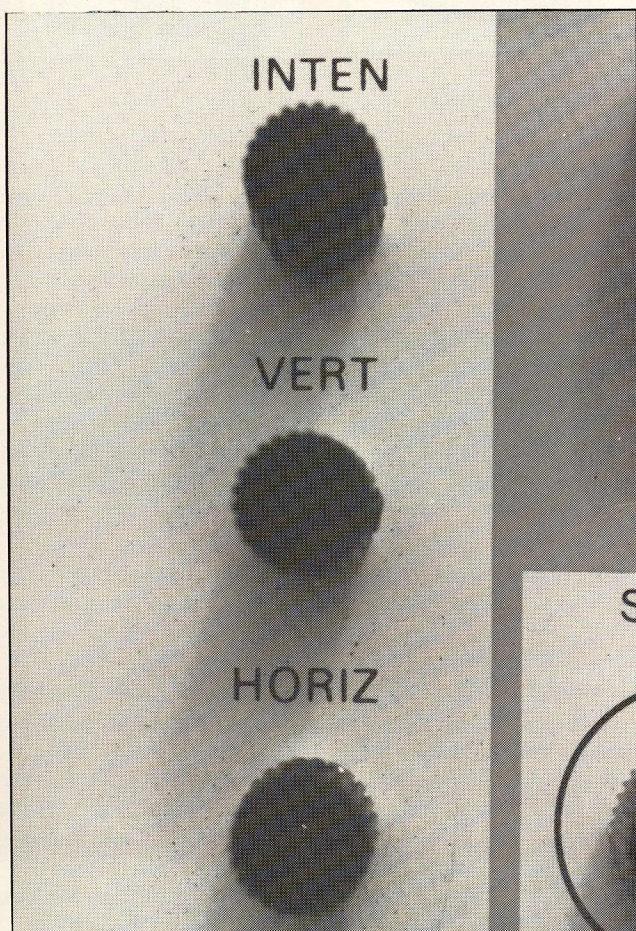
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PSA-35 gives user switch-selectable LNA/BDC (etc.) +18 VDC powering through either of the input connectors.

more frequent applications of their units would come in the field where the installer/troubleshooter was connecting the analyzer to an antenna for TI or satellite checks. It followed that if the battery supply internal to the analyzer was adequate, the analyzer could power **not only itself** but an external LNB



CRT screen display controls for PSA-35 allow user to offset horizontal (HORIZ) control to 'center' display on a single segment of the frequency spectrum; as the SPAN control is then 'spread' out, the centered portion stays in the center and 'expands' in both directions equally.

or LNA + BDC. This means that without any external power at all, you can test a site and align an antenna using the analyzer plus the 4 GHz (to IF) electronics required.

Each unit provides power to the external electronics. Luly does this by tapping into the battery supply line and routing 18 VDC to the small F-type connector on the front of the unit. This 18 VDC is present on that connector at all times in the contemporary units and care must be taken not to 'short' anything that might be connected to that F fitting, as to do so would quickly dump the battery current (and possibly damage the unit). Using the Luly unit with an external antenna system that does not require power adds the requirement that you take care to 'block' the DC coming out of the front panel F connector.

AVCOM does this by providing separate powering and control of that powering with an external switch on the front of the PSA-35. This means that you can either have LNB/LNA/BDC power available, **or not**—your option by switch selection.

We'll look at both of the units during field-test conditions in the final segment of this series and measure their relative abilities to properly power typical LNB packages.

AT This Point

At this point, the functional controls and operational parameters of the two units go in essentially separate directions. We have covered all of the controls and features of the Luly unit, although the AVCOM still has several more important points to consider; hence, this reminder.

Luly set out to build an analyzer which he says "**is especially made for non engineers. This instrument is an aid for the installation and maintenance of earth stations.**" He has done this with characteristic Bob Luly 'style,' and he has brought the product in under the magic \$1,000 mark.

Andy Hatfield of AVCOM had a broader set of goals. While the instrument appears to be considerably more complex, as Hatfield notes, "**The PSA-35 has been designed with such versatility and amplitude accuracy that it will satisfy the beginner as well as the most demanding engineer.**"

It is the 'most demanding engineer' part where the AVCOM and Luly disciplines go their separate ways. The PSA-35 weighs more than the Luly by 70% (7 pounds). Luly packages his analyzer in a leather-type case, with a snap-on protective cover that should reduce the possibility of damage to the CRT display or the front panel of the instrument. AVCOM offers a face-plate cover for instrument protection and, as you read this, a carrying case will also be available. Mis-handling of an instrument such as this is the issue here, and both have at least given consideration to this problem.

A cathode ray tube—unprotected, bouncing around in a truck or van—is a possible target for a loose wrench or other missile which could damage the CRT (and damage is the equivalent of total breakage here, since the CRT is under vacuum). Still, it is no different than carrying around a small portable television set and few of us seem to bust CRTs on portable TVs in normal field use. It may be the price of the instrument that begs additional protection, however.

AVCOM Differences

In operation, the **amplitude display** is of primary importance. The analyzer in our application is seldom used for frequency measurement or even frequency approximation.

QUALITY YOU'D EXPECT, AT A PRICE YOU WOULDN'T.



Introducing the new DSA-644 SMATV satellite receiver and the DSM-110 frequency-agile modulator.

Knowing that DX has created a high-quality system specifically designed to meet the needs of the SMATV market should come as no surprise. But the new low price will.

The new DSA-644 block downconversion satellite receiver offers SMATV operators superior video and audio performance, plus all the features required for quality SMATV installations: detent channel tuning, a video test point, audio and video level adjust on the front panel, unclamped video and composite baseband outputs with de-emphasis on/off switch for descrambler interface, as well as SAW-filtered 30 MHz bandwidth for second IF.

The new DSM-110 frequency-agile modulator, designed to integrate perfectly with the DSA-644, features front panel channel selection of all channels from 2 through W, +45 dBmV output, excellent adjacent channel operation with low spurious output, and IF loop through.

Plus, we've enhanced the DSA-643A.

For even more demanding applications, such as CATV and broadcast systems, we've enhanced our field-proven DSA-643A satellite receiver to offer even higher quality video performance than ever before: improved differential gain (2% max.), improved differential phase (1.5° max.), and improved chrominance-luminance delay (30 nsec.), to name just a few.

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For complete product information, call DX Communications at 914-347-4040, or contact your local DX distributor.



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SINGLE AND BLOCK
CONVERSION

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BNC fitting, easily adapted with plug-in adapter to type F, is for bands 1-4 and 6 on PSA-35.

Rather, the frequency notation function is more of an operating **guide**, helping you determine the relative position within the spectrum of a carrier or carriers. For this reason, and others, perhaps, neither instrument dabbles very long with the frequency accuracy of the instrument.

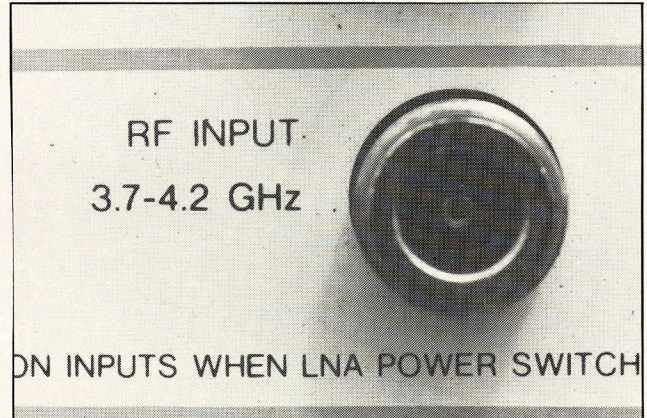
Luly claims an amplitude accuracy of ± 3 dB. AVCOM claims a similar accuracy of ± 2 dB. This means that if you are required to determine the absolute level of a particular carrier or the amplitude relationship between two or more carriers within a display, you can do this within the nearest 3 dB (Luly) or 2 dB (Avcom).

AVCOM's multiple-frequency operating range is the primary difference to consider when comparing the two. Luly, as noted, has a single operating frequency range which is nominally 430 to 930 MHz. However, by placing an LNB in front of the unit, that **LNB input frequency range** (such as 3,700 to 4,200 MHz) then becomes a new frequency range for the Luly analyzer. Actually, any BDC, downconverter, or LNB which **outputs** anywhere within the 430 to 930 MHz range becomes an operating, frequency range extending device for the Luly unit. AVCOM's unit starts off with pre-scaled coverage of the following bands:

- 1) (from below) 10 MHz to 500 MHz (band 1)
- 2) 270 to 770 MHz (band 2)
- 3) 400 to 900 MHz (band 3)
- 4) 950 to 1450 MHz (band 4)
- 5) 3.7 to 4.2 GHz (band 5), and,
- 6) Any customer selected 500 MHz band between 300 MHz and 1500 MHz, with factory changes possible to an input frequency as high as 1900 MHz.

Bands one through four and band six are fed input signals from a BNC-type of connector mounted on the front panel. A BNC to F adapter is used to get to the standard F series fittings for TVRO. Band five is the direct satellite feed, **in the 3.7 to 4.2 GHz region**, and it has its own type N input connector. Either fitting has +18 VDC available from a panel switch; when the switches are off, you can plug into and out of the fittings without fear of spoiling an internal power supply, zapping a fuse, or welding something that accidentally shorted outside of the unit in the test system.

The Luly and AVCOM units are both functional spectrum



TYPE N fitting, compatible with pigtail RG-213 or other lines commonly used at 3.7-4.2 band, accommodates direct plug in of satellite downlink band on PSA-35.

analyzers, but, in our view, they are not competitive units. Because both have been designed with TVRO in mind, and because both provide a way for you to peak antennas, measure cross pole isolation, check LNA/B/C and BDC plus single channel downconverters, **it might appear on the surface** that the two units are tugging in the marketplace for your attention and investment dollars. That's the key here; either analyzer **is an investment, and the price differential between the two does not make the Luly any less of an investment.**

An analogy: In the CATV world, there are several different types of signal level meters available. Cable operators have found that even field installers, who spend the day running drop wires into subscriber homes, need some type of equipment to verify the presence of the appropriate cable service signals with at least some minimum specified signal level (typically, 0 dBmV on a 75 ohm line). At the same time, the cable techs and engineers require relatively precise signal level reading equipment to make adjustments on cable line amplifiers or headend modulators. The two requirements are not the same; one is a 'go/no-go' situation (for the installer) while the second is a **'this needs careful analysis and adjustment'** world.

The parallel we see is that the Luly unit fulfills the first requirement ('go/no-go'), but misses on the second. The AVCOM unit could do either, but why would you equip an installer with an instrument which requires greater operational skills than he is likely to be capable of, or which does things that he will never do on his own?

A spectrum analyzer is a genuine 'toy' for TVRO installers and dealers. You have somehow gotten along without one for all of these months or years and you are still able to function. However, once you do put one to work, you will wonder how you survived without it and you will start to question some of your past problem analysis decisions. When you are in a spot, you have to gather as much data as possible and then try to think out what is wrong and how you'll fix it. An analyzer is the ultimate **'data gathering tool'** for working with the broadband, UHF, and SHF band signals which we have adopted as our own. We'll see how you go into the field and gather data with an analyzer when this series continues in December.

The Only TI Filter You'll Ever Need.



The PFG-series filter...a proven performer that's easy to install.

Using advanced delay line technology, superior interference rejection is achieved over that of conventional notch designs. Installation is easy. Simply make an in-line connection between the down converter and receiver, or in the IF loop.

Our filters have solved over ten thousand terrestrial interference problems for dealers.

It is no longer necessary to carry several filters and diagnostic kits around to confuse your customers. If a filter is the solution to your T.I. problem, one of our PFG-series filters is all you'll need.

And now, there are filters for block down conversion receivers with second IFs of 70 MHz, 134 MHz, 140 MHz, & 510 MHz.

Fantastic New Pricing!

All 70 MHz PFG-30, -40, & -50 filters are now the same price, and it's 10% less than the PFG-30 sold for. Now we offer price, selection, free technical assistance, and the best TI filter available. That's why we are the only TI filter you'll ever need.

ESP has the cure for T.I.

If you need more than a filter to solve your problem, our expert technical assistance is only a toll free call away. Even the best filter needs proper site selection and effective installation techniques.

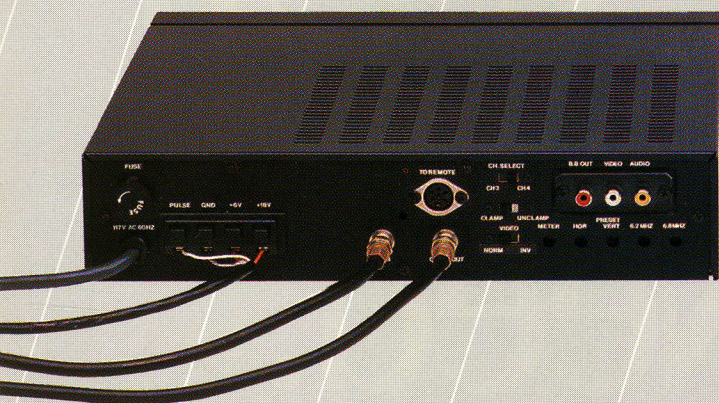
Call and order the book we wrote "Selling and Installing Satellite Systems in Terrestrial Interference Environments". It's easy to understand and will provide you with all the information you'll need to install dishes almost anywhere.

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If you remember when installing a satellite receiver required an engineering degree, you'll appreciate the ease of installing the new Satstar Elan Satellite Receiver.

The Elan requires three simple connections. That's it. You can install it in minutes.

Without adjusting tuning pots to match the downconverter. Without the need for factory supplied cable and connectors. And, if you want to add another TV set, it's easy with our new synthesized dual downconverter. No cross talk. No isolators. No frequency drift. Installing the second or third TV is as easy as the first. The price is easy, too. You won't find features like this on any other comparably priced receiver.

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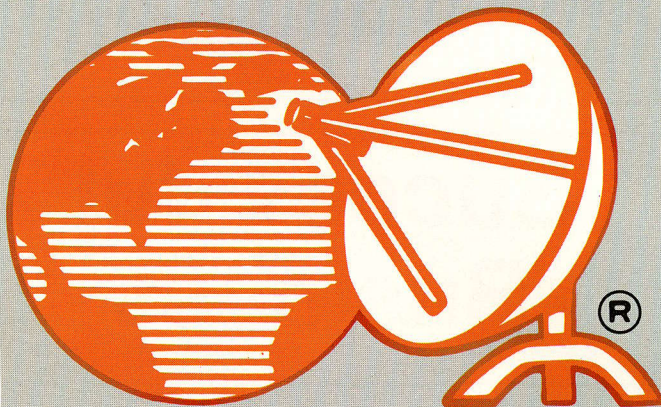
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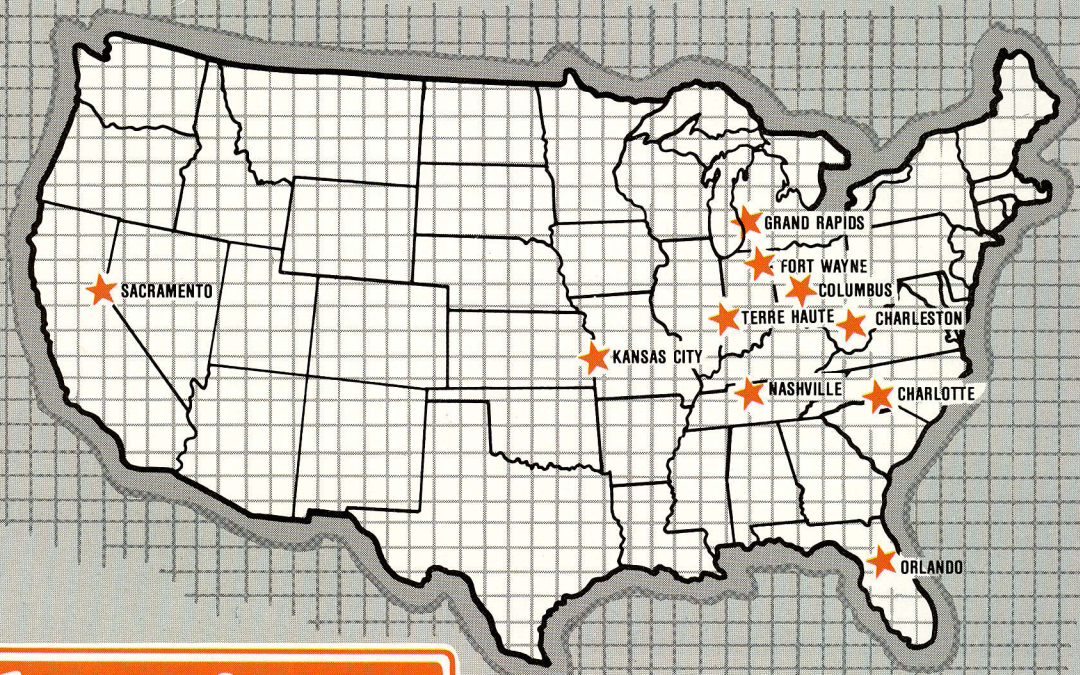
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"NATION'S LARGEST SATELLITE EQUIPMENT DISTRIBUTOR"

Successful Business

By Michael J. Fennell



To succeed in any business, you must follow some simple rules coupled with certain elements of specialized knowledge. This approach allows you to use your common sense and business sense to advantage in a complex business environment.

You will need to attract customers and orders; gather experience and training; prepare a good location; locate qualified advisors, employees and partners; prepare a detailed cash flow plan; establish the business form which will best carry out your plan; develop customer service, marketing and advertising plans; and gather sufficient capital and financing. The basics seem simple enough, but to properly carry them out requires some knowledge of a wide variety of disciplines in the fields of law and management—not an easy task for any single person to master. If your company is small, you will be at a significant disadvantage to a larger company that has a large staff with the knowledge and experience necessary to run a

business. You may need to invest in the advice of consultants to help you develop some expertise of your own, preparing you for the future.

DISCLAIMER

If you are in the satellite television business, you will see a lot of disclaimers, so get used to them. In the future I may explain what to watch out for in disclaimers (but not while you're reading mine).

This analysis describes some basic principles of business organization for profit. Necessarily, it touches upon the law in its various aspects, but it is not intended as a dissertation on business law. This is true for a number of reasons. The law may be a jealous mistress, as my professors used to say (my classmates referred to **her** as a frigid mistress), or "an ass," as Dickens once described it, but the law is a very human institution, as full of contradictions and complexities as any gather-

L U X O R 9 9 0 0

THE
INTELLIGENT
SATELLITE
TELEVISION
SYSTEM

THE LUXOR 9900 KNOWS

Where all the satellites are


Up to 36 satellite locations can be programmed for instant recall. The antenna controller is integrated into the satellite receiver. The hand-held remote control activates a 3-speed actuator action which precisely locates the satellite and fine tunes the antenna position for maximum signal reception.

Where all the channels are

Every channel on every satellite is individually factory programmed prior to delivery. All audio and video information is ready for recall automatically. As new channels are added they can be added to the program. The 9900 is ready to receive individual channel selection information for up to 864 separate selections.

All about stereo Hi-Fi sound

5 audio modes, factory programmed to individual transponders, deliver the right sound system automatically when a channel is selected. Dozens of audio subcarriers can be added to the program for audio only hi-fi enjoyment (including Dolby® Noise Reduction) in addition to television.

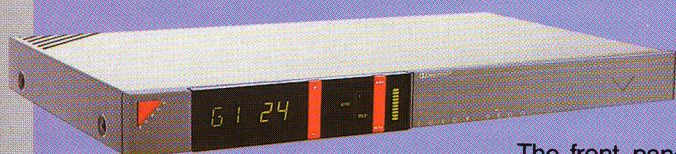


**ALL YOU NEED TO KNOW IS
WHAT SHOW YOU WANT TO WATCH**

L U X O R 9 9 0 0

NOW LUXOR HAS UNIFIED SATELLITE, VIDEO, AUDIO AND COMPUTER TECHNOLOGY IN A SINGLE INTEGRATED HOME SATELLITE TV SYSTEM

So advanced it's as easy to operate as an ordinary TV



The front panel LED display tells you what satellite you're on, what channel you're watching, what sound system you're receiving and a signal bar graph indicates signal strength. All functions are controlled from the hand-held wireless remote.

The sky is alive with the sound of music

Luxor loudspeakers bring new life to TV audio, mono or stereo, and much more. Satellite audio sub-carriers broadcast a wide range of music for audio only. These optional high quality 6-speaker sets (3 per side) are available in passive or active models with sound power up to 40 W per channel. They are specially magnetic shielded for close location to your TV set.



Here is the best of Scandinavian design and high technology. Because Luxor is a leading European manufacturer of satellite products, TV's, audio hi-fi systems, and computers, the company is able to combine these technologies in the advanced 9900 series. After all, Luxor has been a leader in radio, television and electronic technology since 1923.

Simple, clear and color-coded



The Luxor hand-held remote is clearly organized to make life easy. Distinctive color sections present satellite and channel selection functions, tuning functions and switching functions. For most viewing however, video and audio delivery will be automatic. When a channel is selected, the exclusive Luxor Micro-Step™ Tuning System (LMS) automatically seeks out the right signal within that channel's frequency. The receiver automatically compensates for any form of frequency drift due to climate or transponder variances.

An internal TI filter can be assigned to individual channels to minimize terrestrial interference.

And a discrete parental lock-out can eliminate one or more individual channels on a single satellite, as desired.

That's it. Advanced Luxor technology has produced a system so simple to operate, yet complete enough to satisfy the most fanatic videophile and audiophile. For the technician, the Luxor 9900 even has its own diagnostic system built-in and ready at the touch of a button.

The perfect companion



The Luxor Model 9995 Block Satellite Receiver is designed and built to function as an add-on receiver to Luxor 9900 multiple TV's installations. This low cost manually operated receiver offers independent channel selection for TV's located throughout the house. The 9995 can also be used as a stand-alone receiver for both C-Band and Ku-Band reception.

LUXOR HAS ADVANCED THE STATE-OF-THE-ART TO THE POINT OF ELEGANT SIMPLICITY FOR THE CONSUMER AND THE TECHNICIAN

Each electronic innovation is incorporated to aid ease of operation, assure high performance reliability, and maintain outstanding quality of both picture and sound.



9900 Block Receiver

Control Functions

- + Integrated satellite receiver and antenna controller.
- C-band (4 GHz) and Ku-band (12 GHz) capable. Remote control switchable.
- Satellite direct access.
- Transponder direct access.
- + Built-in A/B switch.
- + "Normal" button return to factory pre-set values.
- Built-in polarizer drive.
- Built-in RF modulator.
- Non-volatile memory unaffected by power outages.
- Remote sensor interface.

Programs

- + Factory programmed for individual transponders on each satellite.
- + Automatic correct audio system factory programmed for each satellite and each transponder.
- + Program capacity up to 864 individual selections, audio video matched and fine tuned.
- + Self-diagnostic microprocessor.
- + LED display of satellite, channel, audio system and signal strength

Video Functions

- + Luxor Micro-Step™ tuning system (LMS).
- Baseband audio and video output for VCR or monitor.
- + Baseband input for other video sources.
- Built-in polarity control.
- + Built-in programmable TI filter.
- Raw video (unfiltered, unclamped) for descrambler connection.

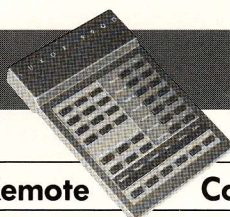
Audio Functions

- + Audio subcarrier frequency read-out.
- Wide/Narrow Bandwidth selection.
- + Remote audio volume control.
- + Remote stereo balance control.
- + Remote Dolby® on/off
- + 5 audio modes—2 mono, 2 matrix, and discrete stereo. Automatic multiplex selection.
- Built-in stereo processor.
- + Direct loudspeaker drive.



9902 Remote Sensor

- Controls satellite system from any room.
- Low-cost add-on for other TVs.
- Comes complete with hand-held IR remote control.



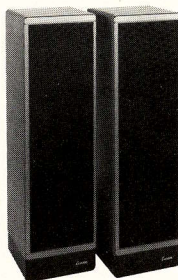
9901 Remote Control

- + Full-function, color-coded IR wireless remote control.
- + Remote ON/OFF
- + Discrete parental lock-out for individual channels.
- + Remote mute.
- + Volume control.
- + Stereo balance.
- Channel UP/Down.
- + Video fine tune.
- + Audio fine tune
- Antenna fine tune.
- Satellite selection.
- Channel selection.
- + Divided into 4 easy-to-read segments: Satellite selection, channel selection, tuning functions, switching functions.



9904 Actuator Interface

- + 36V power supply to antenna drive.
- + Surge protected.
- + Voltage spikes protected.
- + Design coordinated with 9900.
- + Can be wall-mounted out of sight.



9906/9907 Stereo Loudspeakers

- + Passive or active models.
- + Up to 40 W per channel.
- + 3 elements per side; tweeter, mid-range and woofer.
- + Magnetic shielded.
- + Automatic ON/OFF.
- + LED indicators; standby and active.
- + Complete with line cable feed.



9995 Block Satellite Receiver

- + Add-on "slave" to 9900 multiple TV's installations.
- + Can function as a stand-alone block receiver; C-band and Ku-band reception.
- + Manually operated channel selection.
- + Video fine tune. AFC defeat.
- + Built-in V/H switch.
- + Built-in antenna switch for satellite or local reception.
- + Preprogrammed audio frequencies 6.2 and 6.8 MHz.
- + Audio frequency selection 5.0 to 8.0 MHz.
- + Wide/narrow audio bandwidth selection.
- + Raw video output (unclamped, unfiltered) for descrambler connection.
- + External TI filter input.
- + Skew control.
- + Polarizer One control output.

+ Denotes new features available only on 9900 series products.



Luxor High-Performance Microwave Block Downconverters

Designed and constructed for continuous reliable performance, each Luxor unit is individually inspected and tested against all specification requirements. The Block Downconverter (30 dB gain min.) is used in conjunction with an LNA. The LNB Block Downconverter (60 dB gain min.) is an LNA and a Block Downconverter in one compact package. Each unit is weather-tight, rust-proof and fully warranted.

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ing of humans could be. Fifty separate states plus the federal government are constantly drafting, passing, interpreting, and overruling a massive body of statutes, ordinances, regulations, and case law throughout the country. In addition, municipal and county authorities have begun to heavily regulate home earth station installations. If you laid all the laws end to end, there would **be no end**. Therefore, it would be foolish to think that a thumbnail sketch such as this could be complete or entirely accurate for all jurisdictions. This was written to give the business newcomer a basis upon which to make further inquiries into the details needed for the decision-making process. To ensure the success of a new business venture, it may help to structure one's conception of business organization and operation, so that available tools and significant considerations are not entirely overlooked. **Many businesses fail** due to a lack of ability to efficiently organize the business, keep track of profits and losses or to diminish the tax burdens on the business—all despite the efforts of the owners. If we can help you find your way through your basic organization and initial paperwork, we have been of some help.

Use this **article** as a starting point for the questions you will want to ask your legal, accounting, and business advisors in gathering the materials and information you need to operate a business in your area. Your attorney and accountant can help you determine how best to run your business, but if you don't ask the right questions, you won't always get the full measure of service your advisor is capable of giving you. He may not understand all of your special circumstances, so it is up **to you** to give him all the pertinent details.

This material is not intended as a substitute for legal advice and should not be used as such. No warranty, either expressed or implied, is given. You must always check the authorities within your jurisdiction before making business decisions which are controlled by law.

GATHER CUSTOMERS AND ORDERS

There is a chicken-or-egg problem involved here. If you don't have the facilities to service the customers, it is a little foolish to spend the time and money soliciting them. But is it even more foolish to spend large amounts on facilities, equipment and employees if you don't have a plan to bring in the customers, whose purchases will pay for these expenditures.

You don't have a business if you don't have sales.

BUSINESS PLAN

Prepare a detailed business plan, obtain sufficient financing, prepare a detailed cashflow plan, and start with sufficient capital. If you have orders, you may be able to obtain a loan to pay for the facilities to service your customers and to operate your business. If your bank requires more capital than you can muster, you may have better luck in dealing with a finance company. They are not as conservative as the average bank. Also, consider leasing some of the equipment required in order to preserve your cash position. Many banks and stock brokerage houses offer cash management programs and advice which could help you control your borrowing costs. **Prepare a budget** that is as detailed as it can be. Borrow a cost-accounting book from the library to aid you in itemizing all the costs needed for your budget. Include all fixed and variable costs, and add a fudge-factor for the unforeseen problems that can delay your sales or delay payment for those sales. **Do not forget** to include the costs of advertising and sales commissions. **Then double the total of all of these costs.** You may then have **almost** the amount of capital that you will need to survive. This may be an exaggeration, but if this is your first business venture you will be surprised at the costs you will encounter.

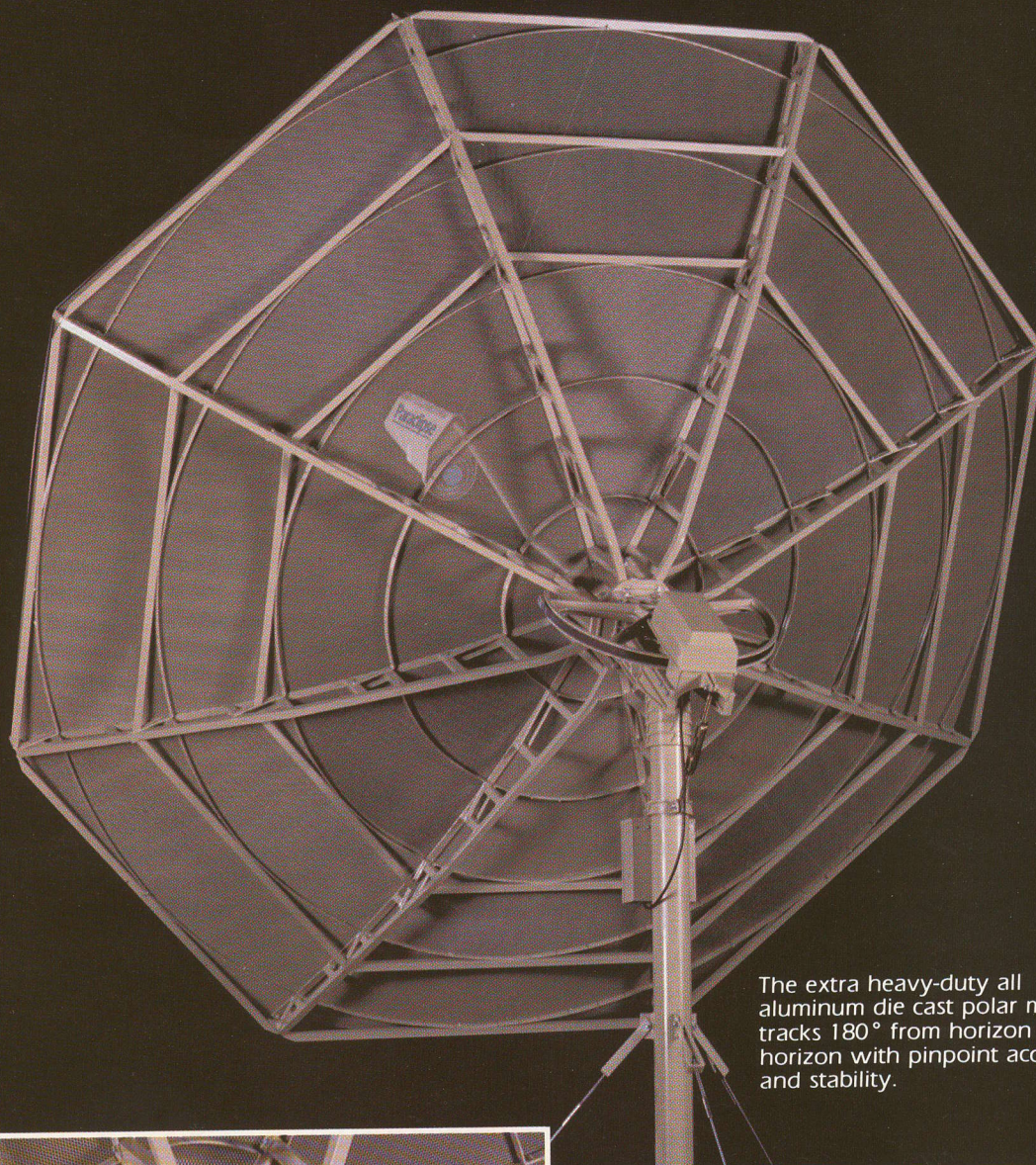
Do not spend all of your initial operating budget on a grand opening for your new business. It would be fine to have some fanfare, but keep in mind that **no single day** in your career will make such a large difference in sales that you could spend a month of operating expenses and come out ahead. Strive for orderly growth over the long haul.

The costs which you have prepared in your budget will be the backbone of your business plan. A good business plan helps you organize, plan and avoid errors. A business plan tells the investor your thoughts and has the added advantage of **forcing you** to think about certain details of your business which you may take for granted or overlook. Try to develop a realistic projection of sales based upon your present sales methods and leads. **Strive to keep your costs within 50% of your total sales.** This plan is simply a written summary of what you want your business to accomplish and when and how it will be done. The plan should contain an advertising and promotional budget which is keyed to your seasonal activities. List the type of people you sell to and the best methods of reaching them.

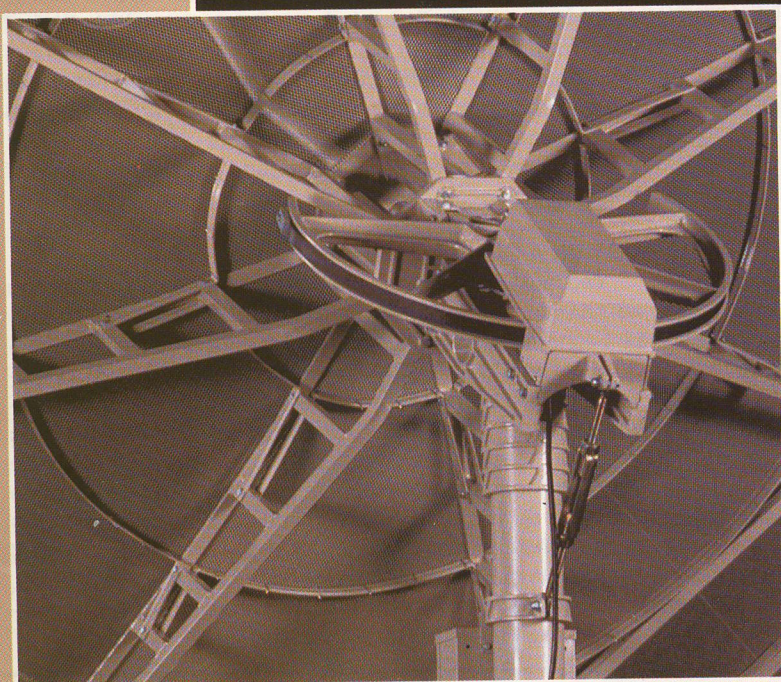
OBTAIN A GOOD LOCATION

You must also make an intelligent decision as to where you will carry on your business. I am told that the three most important considerations in buying real estate are **LOCATION, LOCATION and LOCATION!** The same is true of a satellite television dealership storefront. Obtain a location that you can afford, but keep in mind that you can't afford to run a business without a steady flow of paying customers. **Put yourself in the 'path' of those customers.** You can't afford a cheap location that is not on that path. Whatever you save on the inexpensive location may be more than offset by the cost of locating and dragging in potential customers and in helping them find you. **If they find someone else first**, you are in trouble. You obviously cannot afford to go out of business.

ParclipseTM CD



The extra heavy-duty all aluminum die cast polar mount tracks 180° from horizon to horizon with pinpoint accuracy and stability.



RIGIDITY For an antenna to produce a sharp, clean picture it has to maintain a very high degree of parabolic symmetry. The structural integrity of any antenna design will greatly influence its gain and beamwidth characteristics. Strength is critical for good performance.

ACCURACY In addition to a perfectly shaped reflector, you must be able to aim the antenna with predictable, repeatable precision. A stable, accurate polar mount and drive system will enable you to enjoy truly care-free operation of your system.

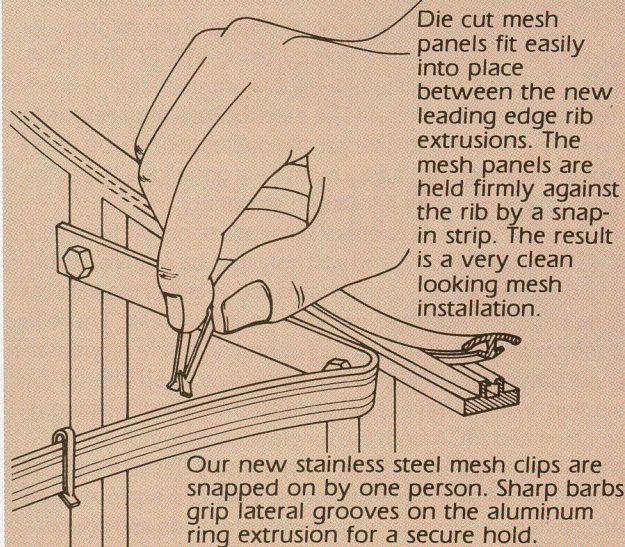
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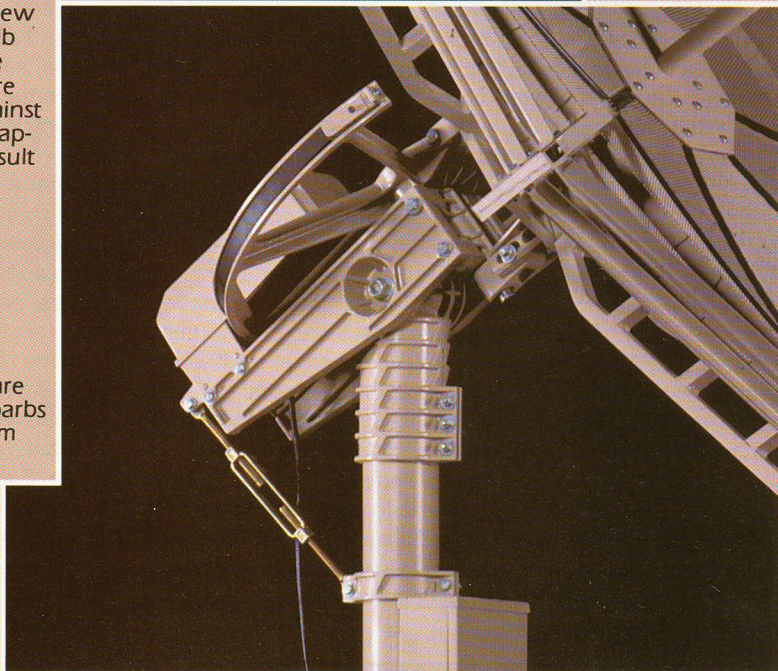
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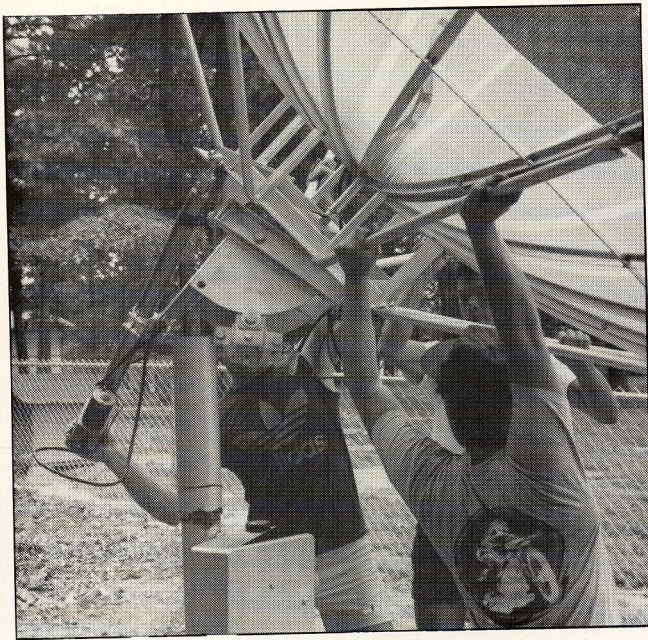
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GATHER SUFFICIENT EXPERIENCE AND TRAINING

This means yourself and your employees. There is no reason, aside from time and energy limitations, why you cannot learn everything your distributor and the manufacturers have published about the equipment you will be selling. I believe the single biggest reason for losing sales is the inability of the salesman to intelligently and honestly answer questions about the equipment he is selling. Some salesmen seem to flourish without knowing much about their product, but in the satellite industry it is not likely that you will get away with this attitude. With the vast array of quality dealer education courses being offered by the larger distributors and many of the manufacturers, as well as SPACE, along with the mass of printed material now available, there is no reason to be uninformed about your product or your competitors' products. An intelligent discussion of the pros and cons of a variety of receivers or components can do much to allay the fears of the potential customer. Learn everything you can. Your knowledge will increase your chances for success.

Any business may operate under **an assumed name**, and most corporations do. You may reserve the name by filing an application and paying the proper fee. The **Secretary of State** will then issue a certificate authorizing the use of the assumed name. **Each year**, you are required to refile and pay the fee again. Prior to reserving the name, it is recommended that you check the records of the Secretary of State to determine whether the name you want has already been taken. It would also be wise to check with the recorder of deeds for each county or the telephone company. This seems like an impossible task, but there is no easy way to cover all the bases.

Finally, before choosing a name and spending a lot of time and money promoting it, you may wish to run a trade name and trademark search to determine whether another company has already reserved it with the **Federal Government**. While you are at it, check all the trade names or trademarks you expect to use in the foreseeable future.

FORMS OF BUSINESS

Back when the earth's crust was still cooling, the only form of business was the sole proprietorship. A bright young troglodyte could tie a flat rock to a stick and be in the axe manufacturing business. No formalities were required. (He might even have had the first-ever advertising slogan: "**Buy this axe and I won't be able to bash you with it.**") But, as man's mind, imagination and social structures have become ever more complex, the methods of doing business and the trappings of business have become increasingly complex, as have the rewards and dangers of doing business. However, with a little study and some good advice, even a new or relatively unsophisticated businessman may take advantage of these newer forms of business operations. A little study will teach you how you can profit from your efforts—rather than lose money on **an interesting 'hobby'** which you may find, too late, that **you can't afford**.

The basic forms that your business may expect to take are the Sole Proprietorship, the Partnership and the Corporation. Corporations are divided into five types: the Domestic Corporation, the Foreign Corporation, Subchapter S, the Closed Corporation, or (rarely) the Professional Services Corporation. Partnerships may be General or Limited Partnerships, and any types of businesses may enter into joint ventures with one another.

SOLE PROPRIETORSHIP

In modern times, there is still little or no formality involved in the creation of this form of business. It is still the easiest way to get into business. In effect, all you have to do is to start selling, whether out of your back door, garage or an expensive storefront in the mall or on a Main Street. In order to operate such a business efficiently and profitably, there are a few things you should do even **before** you start up. If you will have **employees**, even if they are members of your family, you will need to obtain a **tax number**, also known as the Federal Employers' Identification Number, among other things. Your attorney or accountant can obtain it for you by using **IRS FORM SS-4**. Even if you do not intend to hire anyone immediately, it is advisable to obtain the number. **The distributors may refuse to deal with you or refuse to give you the dealer price if you don't produce this number.** It may even be a good idea to put the number on your printed checks and stationery.

You may be required to obtain a license or permit from your local governmental body, and you may also be required to obtain building permits or a zoning variance to install the satellite equipment you will need to carry on your business. **There is no specific tax** on the privilege of operating a sole proprietorship, but you will have to pay the taxes described later in the tax section. You will have to set up the forms for withholding income taxes and FICA from the employees' income.

As a sole proprietor, you are **personally liable** for all the debts and liabilities of your business. **This is a serious matter.** If a customer slips and falls on your premises and breaks a hip, if an installer falls from a scaffold, if a dish frisbees into someone's greenhouse, **you** may be held liable for damages which exceed your net worth. You can provide for such eventualities by obtaining **liability insurance**. It would be quite dangerous to operate a business without it. Insurance policies have stated limits of liability. If a judgment is rendered in an

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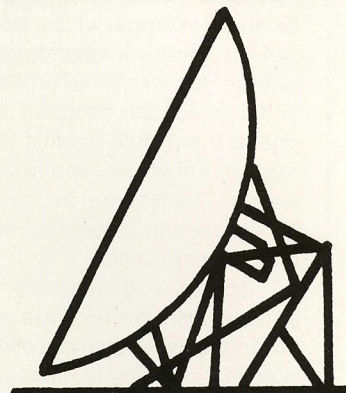
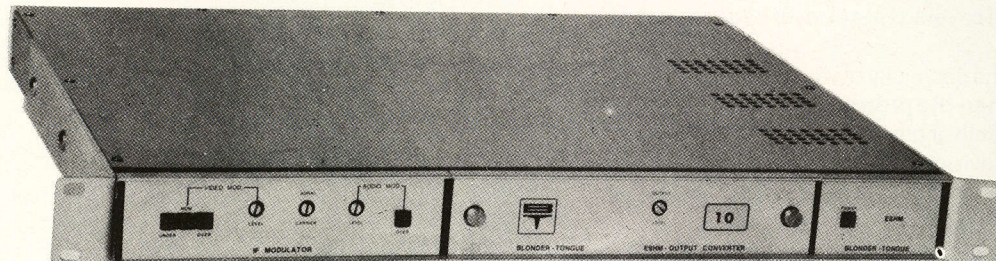
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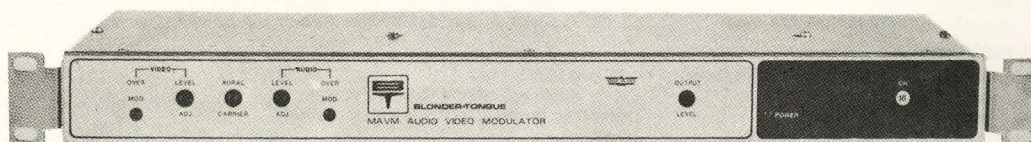
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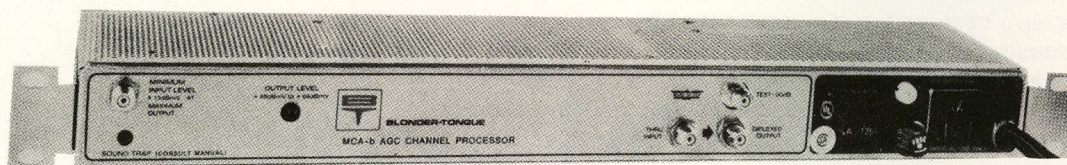
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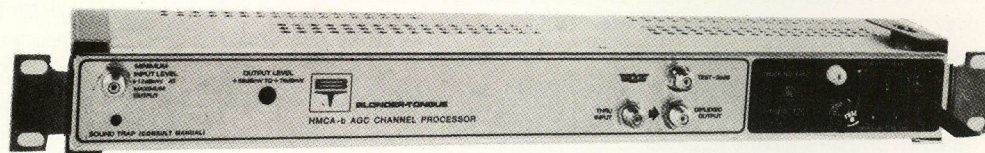
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amount greater than that limit, your business assets and your personal assets are subject to levy. Juries have become exceedingly generous with other people's money in recent years, so that it is impossible to predict the level of liability you may face. Insurance carriers offer what is termed Umbrella or Excess Coverage, which, for a very reasonable premium, can pick up where your standard liability policy leaves off and can provide you with a million dollars or more of coverage above and beyond your standard coverage. **Umbrella policies are cheap insurance** against losing everything you own if your truck rolls down the hill and knocks a busload of people into the weeds. The types of insurance coverages available and the various means of providing the coverages are described in detail in a later section.

You may wish to consider the continuity of your business. **A sole proprietorship ends when the proprietor goes out of business**, whether by sale, death or otherwise. It may be possible in your state to make provisions in your will which will allow your executor to carry on the business rather than liquidating it, so that your heirs may take over a going concern. This can be important, because **a business that is even marginally profitable is worth much more than the liquidated assets would be worth**. We will also consider some forms of business which are designed to carry on, without change, in the face of the death or retirement of the owners or the transfer of ownership.

If you should **sell your business**, it terminates with the sale and becomes a new business from a legal standpoint. This means that **you will not be responsible** for the debts or liabilities of the business after you relinquish ownership and control. If you are buying a business, you will need to make certain that the applicable provisions of any retailer's occupation taxes or bulk sales taxes, use taxes, unemployment insurance, workmen's compensation or other liabilities of the business have been paid up. **Generally, the buyer will be held responsible for these** if the seller has not paid them. You will also want to make certain that any applicable provisions of the Uniform Commercial Code, or your state's code, have been satisfied, along with the matters considered in a checklist to follow.

As a sole proprietor, you are in complete control of your business. **You** make all of the business decisions without obtaining approval or authority from anyone. If **you** do not have and cannot obtain all of the expertise and financing needed to make your business grow and operate, you may need to consider creating an alternate form of business to ensure your success and growth. This may require the sharing of management, authority, and risk by bringing in a partner or partners to help run and finance the business. **No one is likely** to give you the benefit of his money, time or knowledge **without some return** on his investment.

THE PARTNERSHIP

A partnership may be defined as the co-ownership and sharing of profits, losses and liabilities of a business by two or more people. A partnership is created by agreement of the partners to share in this manner. The agreement, in most states, can be written or oral, **but a written document is preferable** to verbal agreements and faulty memories. Many disputes can be foreseen and avoided if the agreement is care-

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fully set out in written form.

A partnership operates very much like a sole proprietorship in many ways, but under the law it is treated, at times, as if it had an existence or life of its own. **It may own property** in its own name, and **can be sued in its own name**, as well as in the name of the individual partners. Property brought into the partnership at the time it is formed, and property which is purchased with partnership funds, becomes **partnership property**. If the partnership is dissolved later, the property **must** be divided according to each partner's percentage share in the partnership. To ensure your proper share, it is advisable to define what **is** and what **is not partnership property when you draw up the partnership agreement**.

The death or withdrawal of a partner and the sale of a partnership interest generally causes the partnership to automatically dissolve, forcing a sale of the assets and winding up of the business. **This can be prevented** by providing in the partnership agreement for some means of continuing the partnership business without interruption. Such an agreement must be very carefully written and should be prepared by your attorney.

Control of the business is shared by the partners. The vote of **the majority** controls all decisions, **unless** some other arrangement has been made in the partnership agreement. If there are only two partners, some such agreement should be reached, otherwise a failure to agree could force the dissolution of the partnership. **Each partner shares equally** in the management of the company, having the power to bind the partnership and his partners to contracts and to carry out its business. **Each partner is individually liable** for the acts of his partners, without regard to the percentage share he owns. Because of the power held by each partner, he has a very high duty to the other partners, also known as a **fiduciary duty**. This means that each partner must act with the greatest possible good faith in all dealings and transactions that affect the other partners (or the partnership itself) in the partnership's business. You may deal with the partnership as an individual, by being a customer, leasing equipment, lending money, and so on, **but you may not compete with the partnership** without the consent of the other partners. The limited partner is an exception to this rule.

LIMITED PARTNERSHIPS

THE LIMITED PARTNERSHIP falls somewhere between a partnership and a corporation, and has some of the advantages of each. It is formed by one or more **general partners** who have all the rights and duties set forth above, plus one or more **limited partners** who do not involve themselves in the business and who, in fact, have no control over the business. Unlike the general partner, **the limited partner is not personally responsible** for the liabilities of the company. A limited partner can **lose this status** and its protection if he gets involved in the control of the business, so **the limited partner should keep his distance**. Read the partnership agreement carefully to make sure that it doesn't give management powers to a **limited partner**, thereby **defeating** the purpose of the agreement.

The death or withdrawal of a limited partner does **not cause** the dissolution of the partnership. In addition, the limited partner can assign or sell its interest in the business to a

substitute limited partner if all of the partners, limited and general, approve. The limited partnership must comply with certain regulations which do not apply to the sole proprietor or the partnership. It must file a **Certificate of Limited Partnership** with the county recorder of deeds in most states, and an **assumed name certificate** if it is operating under a name other than the name of the partners. The announcement of the adoption of the assumed name must be published in accordance with the statutes of the **states** in which the partnership does business. **The limited partner may be liable** to any third party who suffers losses by relying on any statement in such certificates which the limited partner knew to be false.

The filing of the partnership documents may require the payment of a filing fee. If your state has adopted the **Uniform Partnership Act** and the **Uniform Limited Partnership Act**, you will follow the precepts of that code. No tax is paid to organize a limited partnership and the partnership pays no income tax, but **the partnership must file a tax return** showing income and expenses. **Each partner** then declares his pro rata share of the partnership profit or loss on his **individual tax return**.

JOINT VENTURES

A joint venture may look like a partnership in that two or more persons or entities are involved in the same projects and sharing in the profits and losses. But a joint venture involves a single specific transaction or project while a partnership involves a general business of a particular kind. **No formality is required to enter into a joint venture**, but the parties should enter into a written agreement which sets out all of the rights, duties and liabilities of each party.

FRANCHISES

Franchising is the development of an independent sales relationship between supplier and dealer giving the dealer some of the identity of the supplier.

Business format franchising: This form of franchise gives trademark know-how and complete business method and format for sale or rental of products and services.

Mixed franchise: This form provides for product distribution mixed with business format franchise.

Business opportunity venture: This form trades control for assistance. Sellers pay a franchise fee to the supplier and allow the supplier to exercise some control over the operation of the business.

(This series will continue in CSD for December 15th, when Fennell will tackle the subject of corporations and their many varied forms.)

About the Author: Michael J. Fennell is the principal in his own law practice which maintains offices in three Illinois locations, plus a fourth office in Seoul, Korea. Fennell is also a business entrepreneur with a satellite sales and service firm in Illinois, and is General Counsel to an electronics import/export firm headquartered in the Chicago area. A 1969 graduate from Omaha's Creighton University, he obtained his law degree from the Northwestern University School of Law in 1973.

Fennell is the author of a special 'chapter' directed at guiding the new entrepreneur in establishing a TVRO sales and service business in the **'1986 Coop TVRO Handbook,'** now in final production. This article begins a series extracted from that 'Handbook' chapter.

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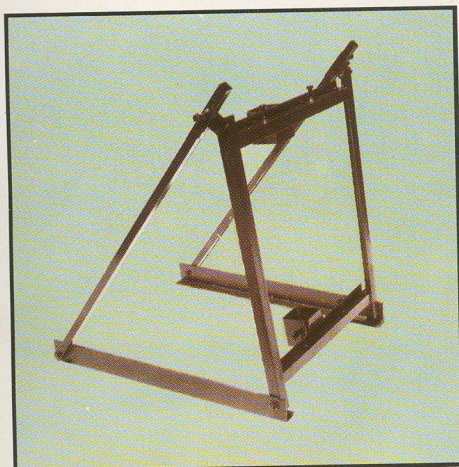
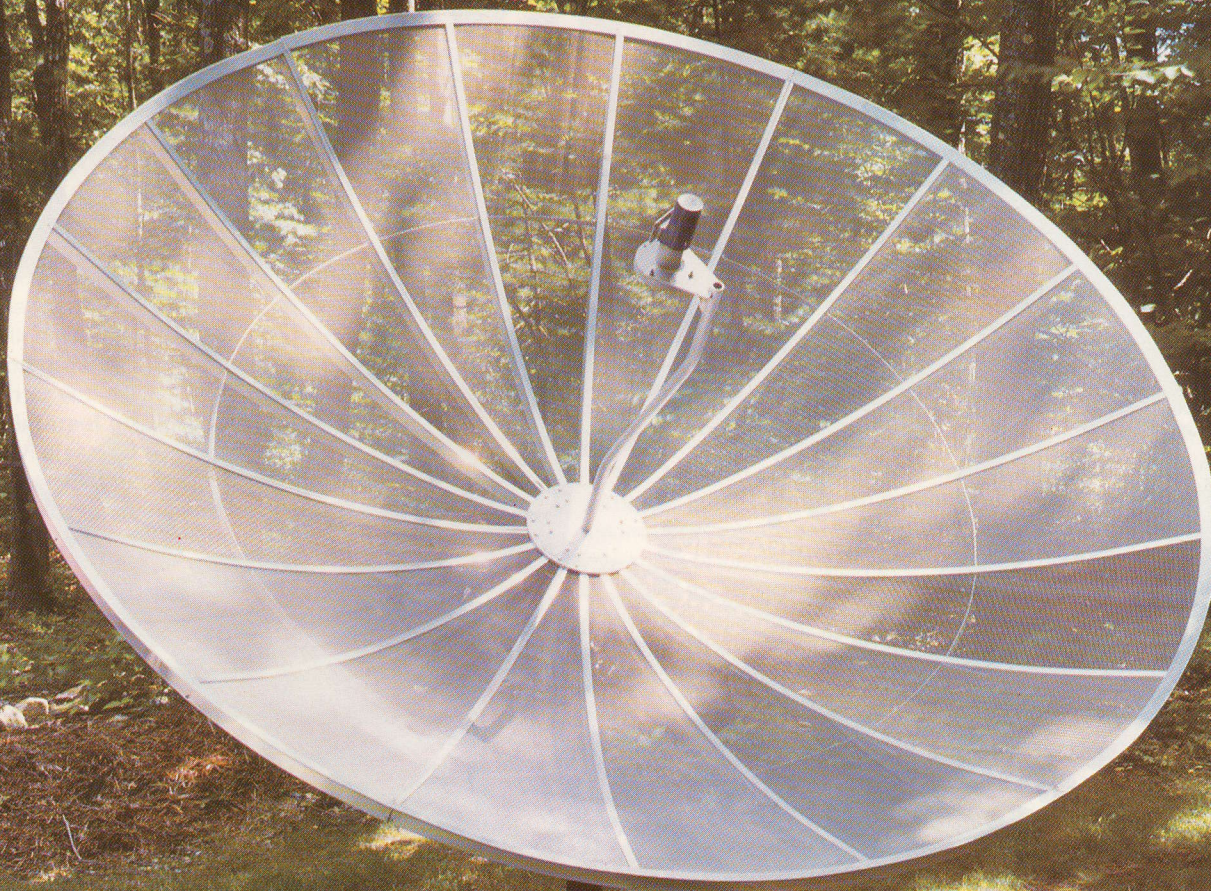
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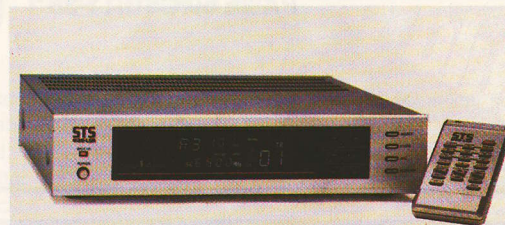
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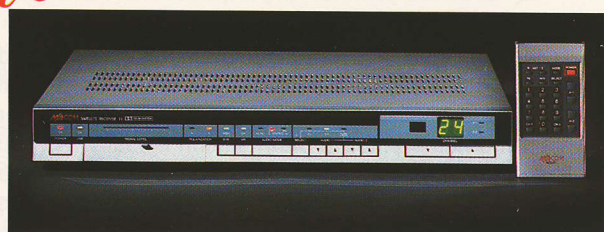
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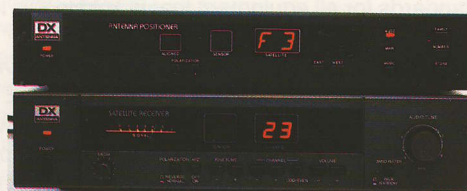
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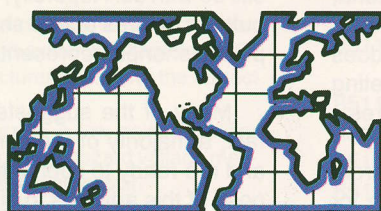


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Home Satellite Equipment Standards and How They Will Affect the Industry

By Mike L. Gustafson

Over the past year many manufacturers, distributors, and dealers have met to try to assemble a list of standards that could be applied to all of the equipment that is produced for sale within the home satellite earth station industry. As you might expect when you try to get more than two people into a room and try to get them to agree on anything, the project has had its ups and downs, but an end is in sight. A meeting was held at the industry trade show in Nashville, Tennessee, and later in September in Dallas, Texas, for the purpose of finalizing standards for all equipment that is sold in this industry.

The standards committee is headed by Guy Davis of Pentec/MTI and was given the charter by the SPACE board of directors to choose subcommittee chairmen from within the industry and form a working group that would put together suggested test parameters procedures which every manufacturer could use to fairly test their products. It was not the purpose of the committee to set minimum or maximum criteria, but only to select what test points are important and how the data should be determined. Obviously, the committee does not have any enforcement powers but relies on marketing pressure to force compliance with the suggested procedures.

Since all the committees were made up of many different manufacturers and interested parties it was not possible for any manufacturer to sway the committee to adopt or abandon some particular test or procedure that was unfair or incorrect. Many favorite oxen were gored during heated discussions that finally gave way to the majority vote of the committees. The final reports or white papers on the intended standards will be released to the industry for final comments before being submitted to the general SPACE board of directors for acceptance. Hopefully, this will allow the industry at large to offer comments and suggestions that will even further refine the quality of the standards under discussion. After the comments are returned to the committee and voted on the resulting standards will be reviewed by another committee and then submitted to the general board of directors.

Once the standards are submitted and accepted by the SPACE board of directors a process will be established that will allow manufacturers that meet the standards, with SPACE's approval in the form of a U/L type of sticker, to state for advertising purposes that they, in fact, meet the SPACE standards for their particular type of equipment. The value of this procedure should be obvious to dealer and consumer alike.

Right now a new dealer or consumer has very little with which to choose the proper product to sell or purchase. When the equipment standards are used the prospective buyer will have at least a minimum value and operation by which to judge equipment. It is anticipated that the days of dealers going through a trial and error purchasing process will be reduced. Because minimum performance standards are not being set, only test items and procedures, the trial and error decision will still be with us. Hopefully, the decision process will not include outright failures due to shoddy workmanship or design or just plain dishonest representation.

Many of the suggested standards are now complete. In fact, a majority of the committees have produced standards and are ready to submit them to the industry. Part of the purpose of this article is to give the industry a quick view of what the standards committee has been working on.

1) The subcommittee on Interface.
Chairman is Bruce Smith of Omni Spectra. 603-424-4111

MECHANICAL SERVO TYPE MOTOR TO RECEIVER INTERFACE

1. The voltage output required at the receiver to run a mechanical servo type feed should be $5.0 \pm .25$ volts.

2. The pulse output required to run a mechanical servo type feed should be .8 - 2.2 M/S.

The repetition rate will be $18.2 \text{ M/S} \pm 10\%$ at 5 volts with a rise time of 10-25 ns and a pulse current of 100 micro amps nominal.

3. The receiver interface to mechanical servo type motor will also have a ground of OVDC.

4. Current required to operate a mechanical servo type feed should be a minimum of .75 amps and a maximum of 15 watts at 21.2 volts peak outdoor hazard voltage measured with any single unreliable component short circuited.

5. Operating temperature should be -40° to $+85^{\circ}$ C.

FERRITE FEED TO RECEIVER INTERFACE

1. The required voltage to operate a ferrite feed should be an adjustable voltage of maximum ± 21.2 volts.

2. The current required to operate a ferrite feed should be a minimum of 200 mA and a maximum of 15 watts at 21.2V peak outdoor shock hazard voltage measured with a single unreliable component short circuit.

3. The operating temperature should be -40 to $+85^{\circ}$ C.

PIN DIODE TO RECEIVER INTERFACE

1. The minimum required voltage to operate a pin diode feed should be a minimum of $\pm 5 \pm .25$.

(a) Ideal operating voltage for a pin diode feed should be a minimum $+$ and $-5.0 \pm .25$ volts.

2. The receiver should also have as a minimum a ground of OVDC.

3. The current required to operate a pin diode feed should be a minimum of 50 mA.

4. Operating temperature should be -40 to $+85^{\circ}$ C.

FEED LABELING REQUIREMENTS AT THE RECEIVER

The suggested labeling of a feed interface at the receiver should be as a minimum the type of feed the receiver is capable of interfacing to as well as its specific requirements, i.e.

Mechanical servo:	Ground; Pulse; $+$ voltage
Ferrite:	\pm voltage; \pm voltage
Pin Diode:	Ground; H; V

LOW NOISE AMPLIFIERS REQUIREMENTS AT THE RECEIVER

1. The minimum required voltage from a receiver to operate a low noise amplifier should be 17.1V and the maximum voltage to be 24 volts with the low noise amplifier manufacturer specifying the correct UL type cable required.

2. The maximum current needed to operate a low noise amplifier should be 15 watts at 21.2V peak outdoor shock hazard voltage measured with any single unreliable component short circuit.

3. The operating temperature should be -40 to $+85^{\circ}$ C.

CABLE AND WIRE REQUIREMENTS

1. Multipurpose satellite cable should be UL listed as Satellite Antenna Cable.

Note: Cable must have printed on it minimum UL requirements, "direct burial", "sunlight resistant."

2. All non-RF cable should be stranded wire.

3. Each component group of signal cable other than coaxial should have a shield with a drain wire.

4. (a) All RF cable should be tested by sweeping over the frequency range of 10 MHz to 1450 MHz.

(b) A DC continuity test should be performed on all finished cable.

(c) A minimum return loss across the band should be 15.0 dB.

5. The recommended color code for operating a mechanical servo type feed should be as follows:

Red:	Voltage
White:	Pulse
Black:	Ground

COLOR CODE:

ACTUATOR

Red $+$ 36 VDC

White

SENSOR:

Gray = Pulse

Brown = -VDC

Orange = $+$ VDC

DOWNCONVERTER:

Yellow

Gray

Blue

Tan

2) The subcommittee for suggested Testing and Measurement criteria, active RF devices.

Chairman is Frank Tackett of Star-Com. 915-263-7512

LNA

85100

RF Specifications

85101 Input Frequency: X-X GHz

85102 Noise Temp. @ 25° C: X°K. (Specify Max., Nom.)

Specify Range X-X GHz. (Test Method A or B, specify)

85103 Gain: xdB, (Max. or Nom.), Specify flatness and/or slope and frequency range.

85104 Isolation: xdB (Min. or typ.), specify Ferrite, electronic or none.

85105 Power Requirements: xx to xx VDC @ xxx Ma., (specify max. or other), insert at output connector or specify.

85106 Operating Temperature: -xx to $+$ xx° C. 2:1 all phase

85107 If dual LNA, specify mechanical and electrical isolation

85110

Physical Specifications

85111 Input: WR-229 Waveguide, (or direct coupled, specify)

85112 Output: Type "N" Connector

85113 Size: H x W x L, xx Lbs.

85114 Weather protection, specify.

85115 Warranty: Specify time, terms and conditions.

85200

RC Specifications

LNC/LNBC (add to above)

85201 Output Frequency Range: Specify, (specify connector)

85202 RF to IF Gain: xdB, (specify Min. or Nom.), Slope and/or flatness.

85203 Local Oscillator: A. Frequency (Range)

B. Stability over Temp. range

C. Type: discrete, DRO, Crystal

85204 Return Loss: Specify Input, Output.

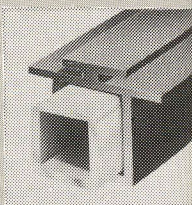
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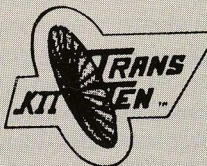
The Trans Series Continues the Tradition of Excellence Found in The Nova Stainless Steel Antennas!

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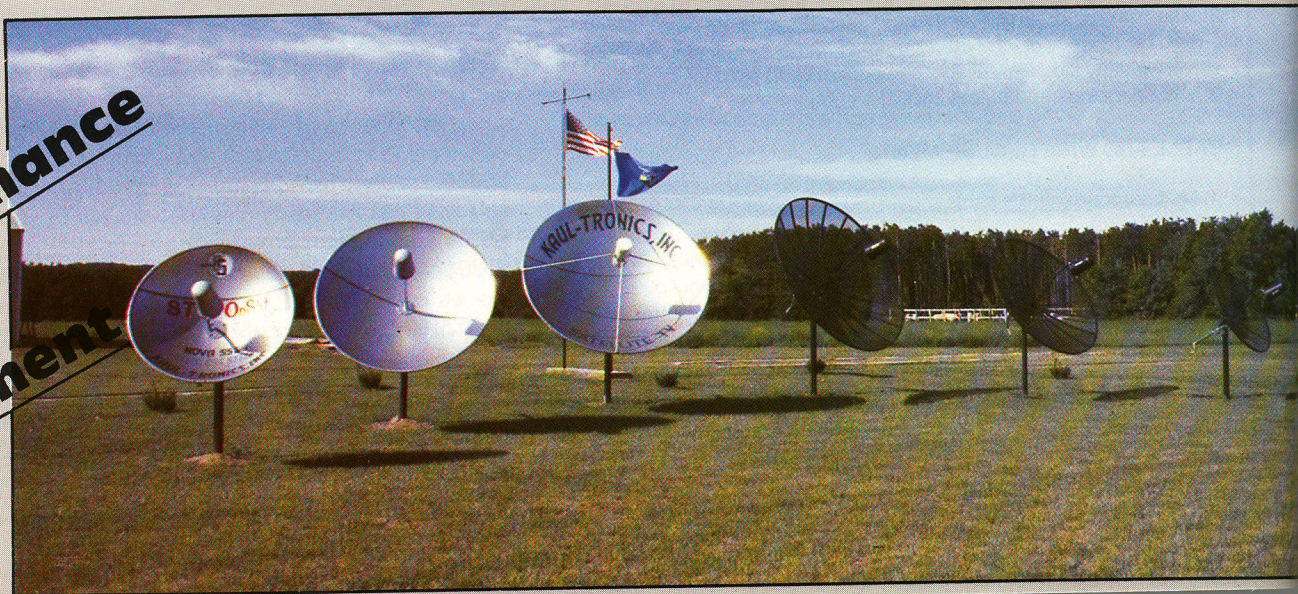
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REGIONAL OFFICES: Kaul-Tronics Rocky Mountain, 4919 North
Broadway, Boulder, CO 80302, Phone (303) 530-3422

Kaul-Tronics West, 4295 Unit D
South Arville St., Las Vegas
NV 89103, Phone (702) 362-5816

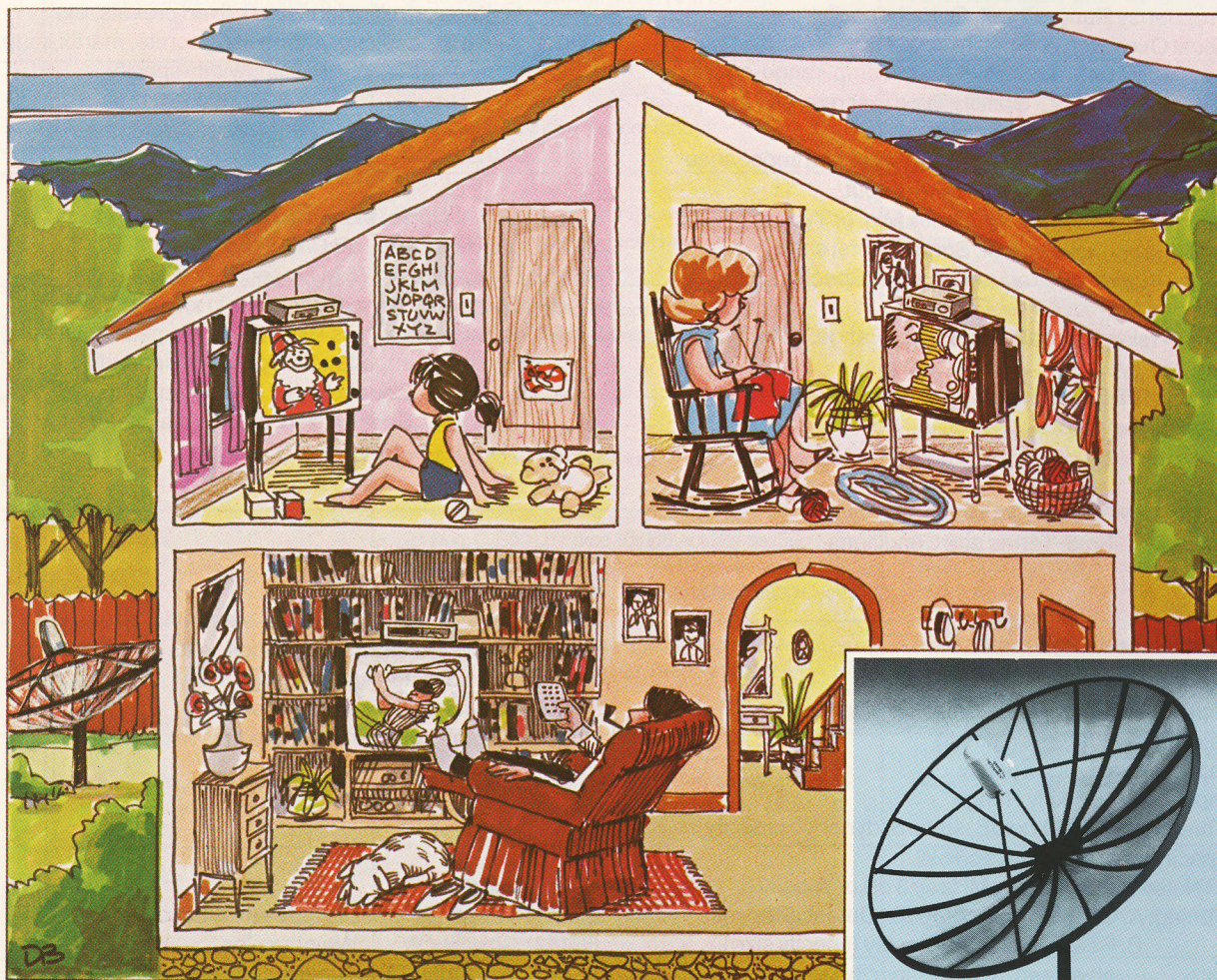
Kaul-Tronics Southeast,
Suite One, 1700 Cumberland Point
SE, Marietta, GA 30067
Phone (404) 955-6682



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Best Investment



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SYSTEM 1000... Full featured block downconversion receiver with infrared remote control.

GENERAL INSTRUMENT

Write for complete product data:
General Instrument
RF Systems Division
2350 West River Park Drive
Tucson, AZ 85745/(602) 575-5600
65 Waverly St. / Delhi, Ontario
Canada N4B 1E8/(519) 582-0710



SYSTEM 950... Block downconversion technology in an attractively styled, low cost package.

DOWNCONVERTER

85300

RF Specifications

- 85301 Conversion, specify single, dual or block
- 85302 Frequency Range: Input, Output-specify
- 85303 Local Oscillator: A. Specify frequency
 - B. Stability over Temp. range-specify
 - C. Specify Type Discrete, DRO or Crystal
- 85304 Level: Specify input and output range and impedance
- 85305 Return Loss: Specify input and output.
- 85306 Image Rejection: xdB, Specify Min. or Typical
- 85307 In-Band spurious output: Specify worst case
- 85308 Noise Figure: dB, frequency range, Specify Max. or Typ
- 85309 Conversion Gain: dB, Frequency Range, specify, max. or Typ.
- 85310 Tuning: VDC, specify range, polarity, (or digital), Connector type.

Physical

- 85321 Size: H x W x L, Weight lbs.
- 85322 Warranty: Time, Terms and Conditions

RECEIVER

85400

RF Specification

- 85401 Input Frequency Range: Specify, Single or Dual, internal or external switching
- 85402 Input Return Loss: Specify
- 85403 Input Level: Specify Range
- 85404 Threshold: C/N AM xdB, static or dynamic (specify), specify max. or typ., spec. B.W.
- 85405 IF Noise Bandwidth: xx MHz @ 3 dB or specify
- 85406 Tuning: A. Control Type, Variable, Detent, Step, etc.
 - B. Readout-Lighted display (specify size), on screen, or other-specify.
 - C. Type—Analog, Volt Synthesized, Crystal Synthesized
- 85407 Controls: Local, remote (specify RF or IR), specify functions controlled. Range of Remote
- 85408 Spec AFC Range

85410

Video Specifications

- 85411 Output xx volts P/P @ 75 ohms, specify polarity
- 85412 Unprocessed: xx volts P/P @ 75 ohms, unclamped, de-emphasized per CCIR Rec. 405-1/ curve A, specify descrambler capability, internal, external, if modifications required.
- 85413 Signal/Noise: xx dB at xx dB C/N input. (CCIR weighted at 10.75 MHz peak deviation) also modulator.
- 85414 Frequency Response: xx Hz to x.x MHz, \pm x.x dB
- 85415 Dispersion Clamp: More than xx dB
- 85416 Modulator: Specify channel(s) in accordance with FCC Part 15, specify if crystal controlled or...
- 85417 Differential Gain: \pm x.x% Video & RF Mod.
- 85418 Differential Phase: \pm x.x Degrees Video & RF mod.

85420

Audio Specifications

- 85421 Tuning Range: x.x to x.x MHz, specify single or dual
- 85422 Tuning Control: Specify Analog, quartz synthesized, seeking or volt synthesized, fixed presets, etc.
- 85423 Audio Processing: A. Specify discrete, matrix, mupx.
 - B. Bandwidth-specify
 - Wide-xxx KHz @ -x dB
 - Narrow-xxx KHz @ -dB
- 85424 Signal/Noise: More than xx dB @ xx KHz (specify bandwidth) at x dB C/N.
- 85425 De-emphasis: 75 Microseconds (or specify)
- 85426 Frequency Response: xx Hz to xx KHz \pm x.x dB
- 85427 Output: A. x.x volts RMS @ 75KHz peak deviation
 - B. Impedance: Specify, balanced or unbal.
 - C. Connector(s): RCA or specify
 - D. Specify fixed, adjustable, metered, etc.
- 85428 THD/100% Dev./400Hz = xxx

85430

Polarity Control

- 85431 Type: Specify if for Servo, electronic, ferrite, etc.
- 85432 Power: Pulse characteristics, volts and ma., max. available, adjustment range if any.
- 85433 Control: Local, remote specify. Automatic, programmable.

85440

Physical

- 85441 Terminals: Specify type and function
- 85442 Size: H x W x L, Weight xx lbs.
- 85443 Warranty: Time, Terms and conditions
- 85444 Temperature Range: Operating and storage
- 85445 Spec input voltage range & freq.
- 85446 Pwr consumption.

85500

Qualified Approvals

- 85510 Specify UL OSA, satellite industry ISC # & F.C.C.

3) The subcommittee for suggesting Testing and Measurement criteria, Mounts, Antennas, Actuators and Feeds. Chairman is Lewis Larsen, L.P. Inc. 501-892-5481

This committee is still collecting data and comments from interested parties. The committee was divided into three sub-groups covering wind loading test procedures on antennas, antenna RF test procedures, and antenna actuator test procedures.

On the wind loading panel the consensus is to accept either of the three test processes: wind tunnel testing, static loads testing or mathematical calculations, but in all cases a Professional Engineer, P.E., must sign off the test data.

	TEST	CONDITIONS	TEST PARAMETERS
1	Performance Specification Compliance @ 25 Deg. C	@ 25 Deg. C, Nominal Motor And Sensor Input Voltages	All Min And Max Performance Specs
2	Functionality VS. Temperature	Test At - 40 Deg. C, + 65 Deg. C, Nominal Motor And Sensor Input Voltages, 0, No Load	Initial And Steady State Motor Current Draw, Sensor Pulse Period, Duty Cycle, Rise/Fall Time, Amplitude And Overshoot, Linear Displacement Rate, Lubricant Viscosity
3	Electrical Abuse	Wire Reverse Polarity, I/O Short Circuit, + 20% Over Voltage — 50% Under Voltage	No Damage, Unit Performs To Spec After Test
4	Static Discharge	2 KV to 20 KV in 2.5 KV Steps, Grounded Case, Voltage Applied To All Wires Individually Or In Any Combination	No Damage Up To 20 KV, Unit Performs To Spec
5	Salt Fog	5% Salt Solution, 35 Deg. C, Sprayed On Units At 35 Deg. C for 96 Hours—Inner Tube Fully Extended	Metal Corrosion/Paint Finish Adhesion Of Tube Casings, Main Housing
6	Life Test	25 Deg. C, 300 Lb Force 10,000 Actuations (5000 Complete Cycles). Actuator To Have Undergone 24 Hour Salt Fog Test At Test Start And After 5000 Cycles	Inner To Outer Tube End Play, Motor Brush Wear, Bearing Wear, Excessive Noise, Wiper Seal Integrity
7	High Temp Operating Life	+ 65 Deg. C For 250 Hrs, Nominal Input Voltage, 10% Duty Cycle, 10 Min Rep Rate. No Load	Motor Current Draw, Sensor Pulse Amplitude And Overshoot Linear Displacement Rate, Lubricant Migration And Breakdown
8	Mechanical Shock And Vibration	Vibration—3 Axis, 4 Hrs Each, 40 Hz .06" Double Amplitude 6 Axis Drop Test—In Its Packaging 30" To Steel Surface, Per Ups Standards	No Physical Damage, Meets All Specs And A Visual Functional Inspection
9	Ice/Freezing Rain	5 Deg. C Water Sprayed On Units At - 10 Deg. C 6mm Ice Accumulation, Soak At - 40 Deg. C For 6 Hrs	Operational Test And Mechanical Inspection Of Paint Adhesion, Seal/Gasket Integrity, Connector Integrity, Internal Inspection For Warped Or Rusted Parts
10	Humidity	Nominal—95% Humidity At 30 To 65 Deg. C 2 Hr Soak At Extremes. 10 Hr Transitions. 10-24 Hr. Cycles	Operational Test And Mechanical Inspection Of Paint Adhesion, Seal/Gasket Integrity, Connector Integrity, Internal Inspection For Warped Or Rusted Parts
11	Hot/Cold Storage	- 50 Deg. C For 10 Days + 75 Deg. C For 10 Days	Specification Compliance Test And Mechanical Inspection Of Paint Adhesion, Seal/Gasket Integrity, Connector Integrity, Internal Inspection For Warped Or Rusted Parts

NOTES: 1. Detailed test conditions for test numbers 5, 8, 9, 10, and 11 can be found
in Mil STD 810D Environmental Test Methods and Engineering Guidelines

On the antenna and feed RF test procedures, panel members are
leaning towards adopting EIA RS-411 as the correct test procedure.
The procedure and test parameters for actuator testing.

A. PURPOSE

To define a set of standard test procedures for the measurement of the
important performance parameters of a linear actuator.

B. PERFORMANCE PARAMETERS OF INTEREST

1. Load and Current
 - a. No Load Current
 - b. Current under various loads (including maximum
load).
2. Slip Clutch Torque
3. End Play
4. Side Load Capacity



Make it simple.

Make it durable.

Make it affordable.

Make it Astro!

ASTRO
INDUSTRIES

When you're choosing a high gain screen antenna you know the market is full of choices. The Astro 10.5 is the best made antenna combining durable quality and an affordable price. The best part, though, is how absolutely simple the Astro dish and mount are to construct and install. Compare the UPS shippable Astro 10.5 and you'll see how it stands out from the crowd. The choice is simple... Make it Astro!

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5. Temperature Cycling
6. Moisture and Freeze-up
7. Corrosion
8. Life Cycling
9. Pulse Count
10. Reliability—Input coming from Amplica's, Bob Farinelli
 - a. Shock
 - b. Electrical Abuse
 - c. Vibration
 - d. Etc.

C. TEST EQUIPMENT

1. Hydraulic Test Rig
 - a. Reference Figure No. 1
 - b. Measures load, current, and slip clutch torque
 - c. With additional equipment, measures pulse counts/inch and cycle life.
2. Side Load Measurement Apparatus
 - a. Reference Figure No. 2
 - b. Measures maximum one time side load.
 - c. Also can give an indication of seal and inner barrel wear rate as a function of side load.
3. Environmental Chamber
 - a. Capable of -40°F — $+140^{\circ}\text{F}$.
 - b. Should be large enough to extend actuator at least 5".
4. Salt Spray Chamber
 - a. Measures anti-corrosion properties of actuator components and hardware.

4) The subcommittee for Aggregation and Dissemination of Laws and Regulations in the Earth Station Industry.
Chairperson is Nancy Turpin-Sherwood of Odom Antennas. 501-882-6485

SUBCOMMITTEE REPORT

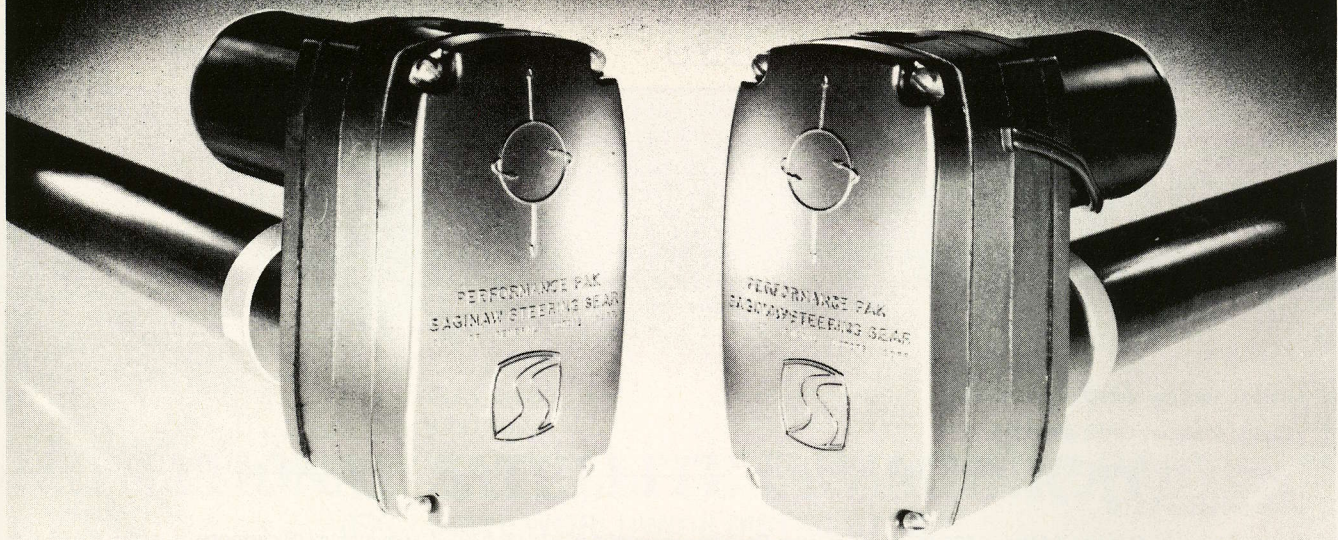
I. RESPONSES/RESEARCH GATHERED — By State

To date correspondence, copies of laws and regulations, research and/or questionnaires have been received on the following states:

Alabama	Alaska
California	Colorado
Connecticut	Florida
Georgia	Indiana
Kansas	Kentucky
Maryland	Michigan
Minnesota	Missouri
Nevada	New Mexico
New York	North Dakota
Ohio	Oregon
Pennsylvania	Rhode Island
South Carolina	South Dakota
Tennessee	Virginia
Washington	Utah

(A total of 28 states have responded to inquiries. Follow up has begun on first and second requests for information.)

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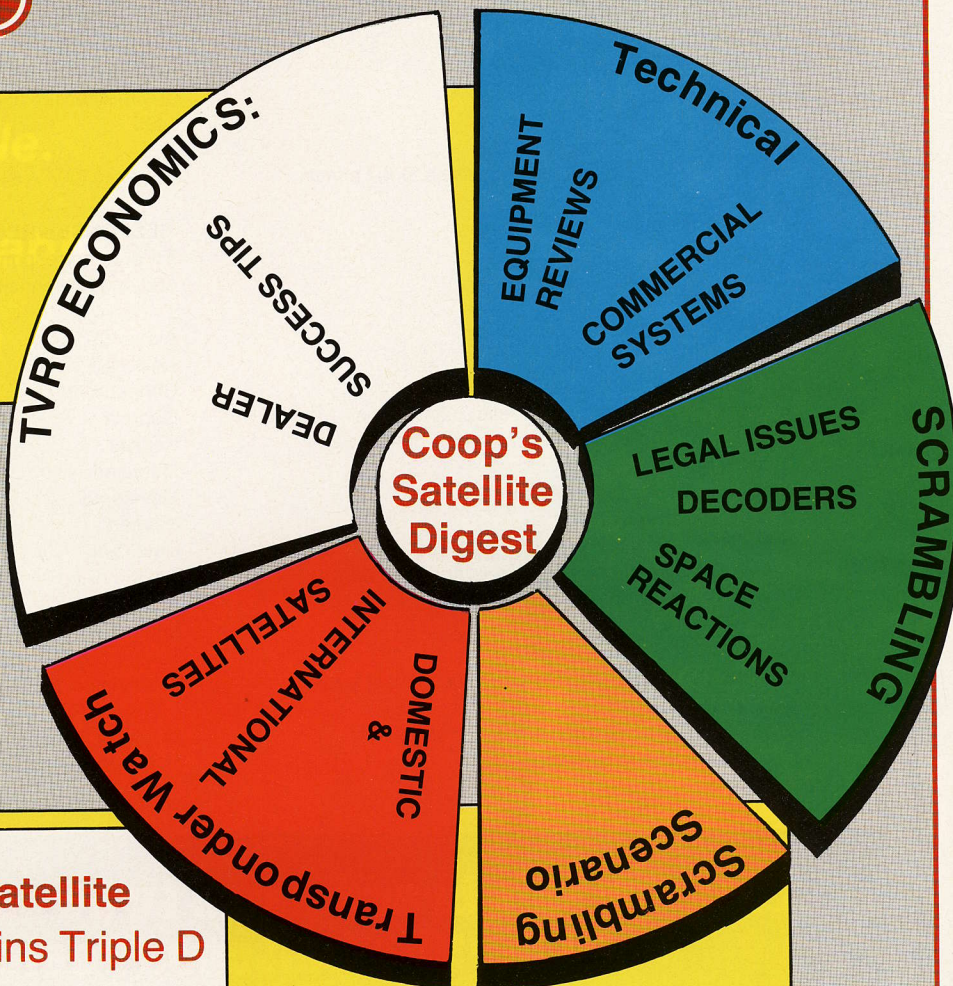
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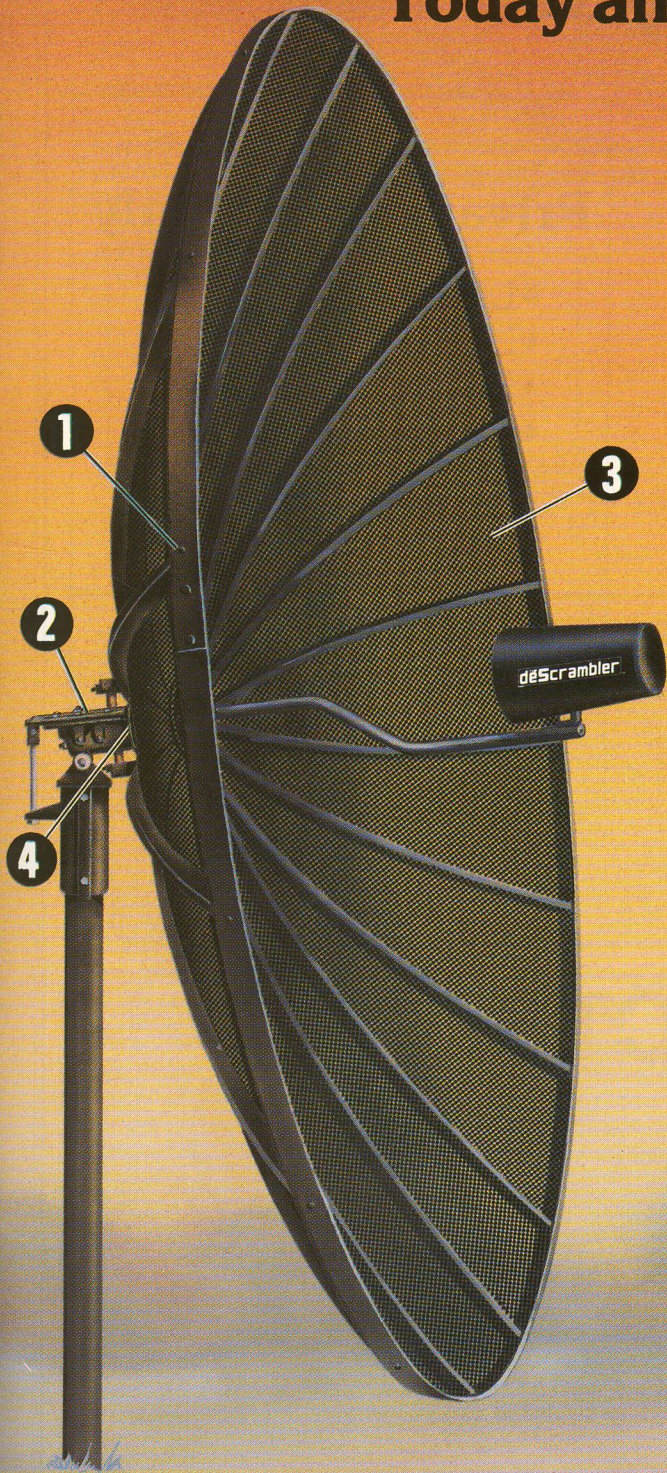
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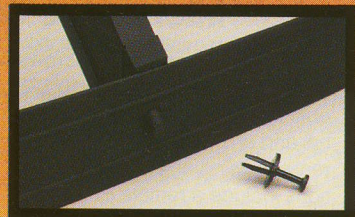
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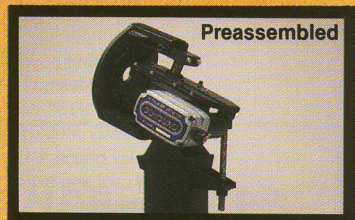


1



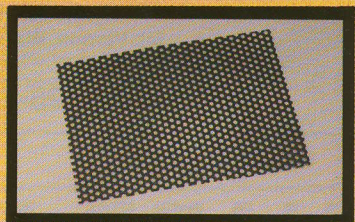
Snap together rim for easy installation

2



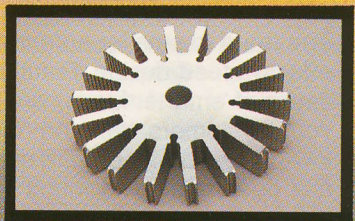
Permanently lubricated motorized mount

3



Perforated aluminum .040 thick
4 ghz & 12 ghz compatible

4



Patented hub design for easy installation

CALL.. NATIONAL SATELLITE COMMUNICATIONSTM
(EXCLUSIVE WORLDWIDE DISTRIBUTOR)

THE deScramblerTM

(UPS SHIPPABLE - EASY INSTALLATION, 9 BOLTS)

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PIONEER MEMBER OF
SPACE



NATIONAL 1-800-833-4485
IN N.Y. 1-800-522-3538

10.525 GHz Microwave System

The Westplex portable microwave system is a budget priced FM link operating at 10.525 GHz. The system is capable of transmitting NTSC color video, plus an audio channel and an optional duplex phase or dataline. 40 miles are realistic using an optional 2 ft. dish at each unit. Other options include a remote RF head, AC/DC operation, 35 mw or 50 mw output.

The Westplex system is ideal where a cablelink is impractical, such as across roadways, waterways and where trenching or cable lines are not feasible.

ADVANTAGES:

- FM superhetrodyne design
- Sectional design for easy service
- Full color NTSC compatible
- Extremely simple to operate
- Duplex phone, data, or control line
- Low cost and extremely versatile
- Full metering
- Systems from \$2500.

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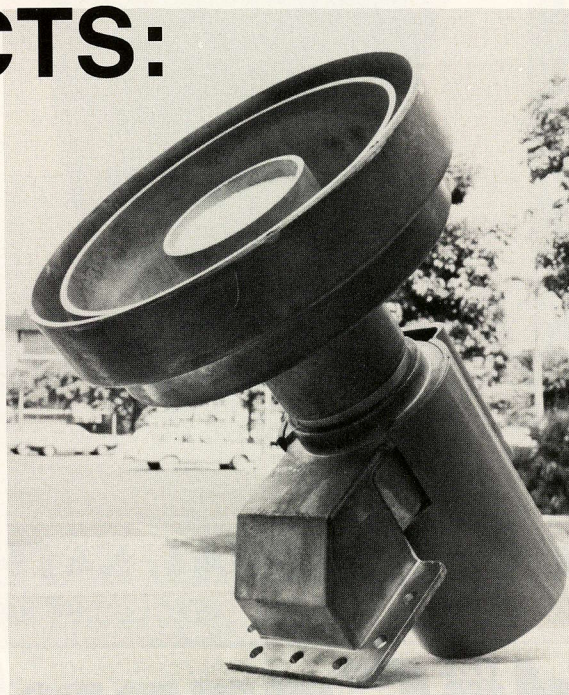
HARD FEED FACTS:

NUMBER ONE/ Of A Series

The trend to smaller antennas presents a challenge to effective feed-design. Fractional-dB improvements, because of 'smarter feeds,' are especially important when your customers demand 'big-dish-performance' from low-profile small-aperture surfaces. **NATIONAL A.D.L.** has been designing feeds for TVRO since 1980. Our philosophy has been to produce the best feeds, not the most feeds. That has kept us as 'the small, high quality' feed antenna house. **NATIONAL A.D.L.** is not a 'household name.' We are simply the best designers of 4 GHz feeds in TVRO today. Let us prove it to you; our prices are comparable with the big feed names but our performance is not. We are ALWAYS 0.25 to 1.0 dB better in performance than 'Brand C.' **We make small dishes 'sit-up and talk'!**

'NOW you have a CHOICE in feeds'

ROTOPROBE feed with 'TI rejection' shroud/ Raised motor mounting pad keeps water from entering feed/ 90° elbow built in — no flange to leak, no improper gasket seals/ 3-wire servo and 2-wire DC motor operation/ ALL aluminum die-cast alloy/ Universal mounting holes for virtually any mounting configuration/ 35 dB isolation between polarizations (minimum)/ VSWR 1.3 to 1 or better over 3.7 to 4.2 GHz/ Nearly five-years of established performance history.



**NATIONAL A.D.L.
ENTERPRISES**

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Simi Valley, California 93065
805/526-5249

II. RESPONSES/RESEARCH GATHERED — Other

In addition, information (including correspondence, copies of applicable laws or regulations, questionnaires, etc.) has been collected from the following other sources:

- A. Testing Labs
 - UL Laboratories
 - Hyak Laboratories
 - Electro-Service Corporation
- B. Canada
- C. National Sources
 - FCC Regulations
 - National Electrical Code

By the end of the year it is anticipated that all of the suggested test criteria and procedures will be completed and out into the hands of the industry. If anyone has any thoughts or comments and wants to help in the process, and help is the operative word here, you are encouraged to contact the chairperson or subcommittee chairperson with your support.

In many ways the home earth station industry is coming of age. The creation of the standards committee is probably the most important step down the path to raise the level of the quality of equipment offered for sale to both dealers and consumers. Everyone benefits from the successful completion of the standards committee efforts. As an industry, we should do all in our power to see that the standards are fair and just and once the standards are accepted, we should encourage all manufacturers to adopt the standards.

INDUSTRY AT LARGE

CORRESPONDENCE, NOTES, REBUTTALS AND CHARGES . . .

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BAD Light?

The enclosed letter has been written to the Janeil Corporation regarding their three page advertisement which we feel is a negative point of view against towers and antenna installations. This sort of advertisement only fuels the fires of dissent towards antenna installations as the satellite and communication industries are continually fighting this type of negative view.

Chuck Tabacchi
Advertising Manager
Rohn Products
P.O. Box 2000
Peoria, IL. 61656

And the letter to Janeil:

Your new three page ad series is created in a bad light. You beat around the bush about solving microwave interference by downgrading another antenna installation.

The persons sitting on zoning and regulation boards love to have a manufacturer such as yourself feed fuel to the fires of dissent towards antenna installations. The satellite and communication industries are continually fighting against this type of negative look upon antenna installations.

Your reference to the microwave tower and antenna installation as being 'ugly and monstrous' was uncalled for and could have been approached from the positive instead of negative point of view. Quite obviously the people who composed this ad were grabbing for straws and overlooked the obvious reason to expound the attributes of your receiver. The microwave signal is the culprit, **not the tower and the antenna!**

Do the communications industry and yourself a favor and refrain from the use of this negative ad. They (readers) forget your ad but

remember the antenna type installations when they begin to write zoning ordinances which Janeil will eventually also suffer from.

The three-page Janeil advertisement, run extensively this past summer, depicts a sizeable microwave tower as a '400 foot monster' of 'impenetrable steel.' **It uses phrases such as** "And its not a pretty sight." **Certainly, a firm such as Rohn, manufacturer of these 'steel monsters' could be expected to take exception to having their products so labeled. As you might expect, Rohn is 'sensitive' to this sort of blanket condemnation of towers.**

But is it in 'poor taste?' **Zoning boards do indeed often have the opportunity to pass or reject applications for microwave towers, just as they increasingly are becoming involved in similar applications for small TVRO antennas and towers supporting such antennas** (towers, we might note, offered by Rohn). **The '400 foot monster' depicted in the Janeil advertisement could only be beautiful to its mother and father or a ham radio operator. Perhaps, unwittingly, Rohn has hit upon a promising new way to battle TI in residential regions; draw zoning board attention to the 'appearance' of this 'monster' and then supply the zoning boards with data from the State of New Jersey which claims that microwave transmission facilities may be the cause of unusually high cancer and birth defect rates. Certainly forcing microwave towers out of urban areas could not hurt our long term sales objectives within such urban areas while such a battle smacks of emotionalism. All is fair in 'love and war!'**

ANY Lengths?

An acquaintance, a totally dedicated professional football fan, found he could not install a conventional TVRO in his downtown Manhattan apartment situation. We agonized about this and then I recalled his living room window had a southerly exposure; straight at the

Clarke Orbit Belt. So we rounded up a DX 12 GHz package and antenna and cautiously transported it to his apartment mid-way up the Manhattan skyline. As the photo shows, his southerly view is adequate (the offset fed DX dish, from the rear, 'looks like' it is pointing dead into the 60 story building in front—it is not) and now he has access to all of the NBC games fed on the Ku-band, right through the middle of New York City and his multi-paned glass window. Where there is a will, there is a way!

Peter Sutro
MPI Satellite
Bernardsville, NJ

Score one for the professional sports fan who refused to take no for an answer. We've said it before and we'll repeat it here: when the new RCA Ku-1 and 2 birds get operational over the next few months, 12 GHz is going to bust wide open.

BLIND TVRO

The DX Radio Network is very interested in including portions of TVRO publications dealing with satellite communications on cassette tape for the visually impaired. The DXRN is the nation's largest supplier of communications related material on cassette tape for the visually impaired. This is done on a non-profit basis and is supported by publishing groups who supply copies of their publications. In return, we provide information from the advertisements to our listeners as well. The visually impaired are very much interested in TVRO and in particular the audio-only services are much used by this segment of society.

Phillip Dampier
Director General
DX Radio Network
3176 Elmwood Avenue
Rochester, NY 14618

The 'sound of satellites' can be as captivating as the 'look of satellites' for those who have specially developed senses in the hearing area. Many avocations such as amateur radio have developed unique tools to allow the blind to operate complex equipment which normally demands the ability to see. There is an area here where the proper sensitivities to need would lead a design engineer to create TVRO receiver interface equipment which would greatly expand the horizons of those who do not have full sight sensory use. As the TVRO commercial hardware world becomes more complex, the larger suppliers become more intensely directed to mass appeal products. This sort of 'marketing nitch' should be filled by a supplier who would like to stay in the receiver business with a unique product line requiring special low volume skills. This sounds like an AVCOM type of project to us.

\$6.00 IS Cheap

As a recent STVRO member, I am concerned about the possibility or probability of the scrambling of many channels. I read a letter in some publication where you were quoted as saying you could build a descrambler for HBO signals for \$6. If this is true, I would appreciate more information on this including catalog sheets and prices for this equipment.

Al Christopher
710 Cottonwood
Starkville, MS 39759

It is unlikely that anyone will be building a Videocipher type work-alike descrambler for \$6 anytime soon. What we 'may have said' is that those receivers which are not instantly, out of the box, capable of interfacing with the VC-2 or other M/A-Com descramblers could be retrofitted with the necessary parts and design circuit changes for about \$6 total cost. Sorry, but beating Videocipher for \$6 is not yet here.

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Choice of the Satellite Earth Station Industry

ORIGINAL?

In a letter dated March 6, I took Mr. Paul Gagliano of Southern Star Satellite Systems to task for an apparent rip-off of our **Eliminator** antenna design. I had not seen the actual antenna (other than through some rather poorly taken pictures reproduced in **CSR** last February), and in order to substantiate, I asked you to make some inquiries of Gagliano to have a look at his math. I also asked you to hold off publishing my letter until I was able to have a look at the Southern Star antenna.

Since that time I have heard nothing from **CSD**, although I did track down the antenna at the Nashville show. What I saw was, in my opinion, little more than a poorly executed knockoff of our product in Gagliano's booth. I went by the booth on two occasions and I believe Gagliano knew who I was and that he 'hid' behind his antenna when I came by.

I am not happy since **CSD** has failed to substantiate the claims it has made about Gagliano and his 'new generation' dish. Bob Cooper has seen our dish in operation and I am both surprised and miffed that in the articles he has written about this type of product (June **Radio Electronics**) that he would not at least give our product the same kind of recognition that he has given to the guy riding on our coat-tails.

David Brough
Commander Satellite Systems
309 Steeles Avenue East
Milton, Ontario
L9T 1Y2 Canada

Gagliano's Southern Star product was featured on the February front cover for **CSD** (2/01/85) and an inside report talked about the 'new generation of fiberglass design' which Gagliano

had brought to the antenna world. More extensively, a four-part series appearing on the Boresight TVRO Program at about the same time allowed Gagliano the opportunity to talk about fiberglass versus metallic antenna designs, and to describe his sub-reflector feed approach to a small dish which he claims makes excellent sense in areas where TI is troublesome.

For the record, Brough's **Eliminator** series, created by Brough and fabled antenna designer Nelson Ethier, was second in this design area, behind one previously produced by Harris. The Harris antenna was exceptionally expensive, exceedingly overweight in antenna and mount, and dealing with Harris as a TVRO or SMATV installer was an exercise filled with frequent disappointments. Brough recognized wisdom in the Harris design approach, (and by chance, we ran into Brough and Ethier and Harris in Florida when we visited Harris some years ago) and the likelihood that an antenna this expensive and heavy was unlikely to ever make a dent in the TVRO and SMATV marketplace. He returned home to Canada to build an antenna which worked along the same general philosophical lines at a lower price and weight.

Gagliano's contribution is not that he has created some startling new breakthrough in antenna/feed design, but rather that his previous experience in high-tech fiberglass has allowed him to concentrate on refining the sub-reflector fed antenna into a lighter-weight package. His under-8-foot model has been selling along Florida's west coast for more than a year; a more recent just-under-10-foot model has been on the **CSD** test range since last July where data is being gathered on its long term survival under gusty wind conditions.

Brough, in one of the hallowed best traditions of our young industry, took a promising antenna design technique and engineered around the complaints of users to create a better mousetrap. Gagliano, in that same tradition, is trying to one-up Brough.

TRANSPONDER WATCH

RECENT REPORTS OF ACTIVITY ON DOMESTIC / INTERNATIONAL SATELLITES

Send your reports to **CSD Transponder Watch**, P.O. Box 100858, Ft. Lauderdale, FL 33310. For late news, call (305) 771-0505.

ARIANE launch failure with Spacenet 3 and European ECS-3 birds onboard likely to have profound impact on future bird launches. Rocket mis-guided, had to be destroyed by remote control to prevent system from slamming back to earth. Two birds were insured for total of \$175M (US). Ariane had nine successful launches prior to mishap.

HUGHES Communications, meanwhile, is claiming \$85M (US) loss for Syncom IV military bird which it leases to US government. UHF radio command link apparently failed because of faulty cabling. Hughes will attempt launch of spare, on ground (Syncom V) bird as replacement.

NINETEEN birds out of total of 147 launched since Syncom I (February 1963) have failed to achieve Clarke orbit. Of all launches to date, 12.9% have failed although loss rate was declining before most recent problems. Insurance premiums averaging 17 to 20% of bird + launch replacement value have been in effect and with recent launches, insurance premiums approaching 25% of bird + launch cost are anticipated.

UK TVRO receiver system manufacturers are calling for 'pre-emp-

tive voluntary payment of programming fees' by growing number of TVRO users in UK. Although most European services of value now transmit without scrambling, after many began with scrambling and dropped it, UK suppliers anticipate renewed push to scrambling if home system growth continues to climb. They suggest point-of-sale fee payment but it already may be too late since UK programmers following US NCTA lead are calling for 'RFP' for universal scrambling system.

US cable programmers are split into two and perhaps three 'camps' on the scrambling issue. Group of 'independent' programmers, including WTBS and Showtime, want to manage their own marketing. NCTA, apparently with agreement of HBO, wants to do it through cable industry consortium. Non-aligned group is still not certain scrambling is necessary.

HBO has set 'firm date' when all of its Cinemax and HBO feeds on G1 and F3R will be scrambled fulltime. **January 15th**, according to HBO announcement, will see end to any 'free' transmissions. They feel there will be adequate scramblers 'in pipeline' and marketing of

descramblers will be 'universal' before that date.

S1618 is Senate bill number assigned to measure introduced by Tennessee Senator Gore, as promised in Nashville. Bill is called 'Scrambling Viewing Rights Act of 1985' and it would establish FCC as 'court of last resort' if programmers scrambling did not make their programming available at 'fair marketplace rates.' Bill is actively soliciting co-sponsors and it parallels bill introduced into House last spring.

JAPANESE satellite consortium consisting of RCA and Sony proposing twin Ku band birds at 144 and 148 east with 16 operational 24 MHz wide transponders of 20 watts each, paralleled by 20 Ka band (20 GHz downlink) transponders 100 MHz wide with 20 watts power. All transponders would provide 'JAW' (Japan-wide) coverage, less some off-shore islands.

INTELSAT plan to sell-off 'spare' transponders for as low as \$3M (US) for (remaining) life of birds drawing considerable attention; PanAmSat, licensee for a private international system, is crying foul. General feeling is that Intelsat, with price-cutting move, has 'proven' they have launched too many satellites and solution is to cut back on number of birds thereby reducing their overhead.

ARABSAT having problems of operational nature according to European reports; consortium allegedly behind in payments to contractors who built and helped launch two-satellite system. Additionally, many member nations in 22 country group reportedly have not paid for their share and system is badly under utilized because of lack of interest from participants.

DEPARTMENT of Justice latest player in on-going scrambling rhubarb. DOJ lobbied by SPACE to investigate allegations of improper handling of cable programmer marketing plans has reacted with written notices to CATA, NCTA, and other cable/programming groups. Letter warns recipients 'not to destroy or alter records or correspondence' on this issue pending full investigation.

DEALER survey reveals 'scrambling confusion' on the part of consumers major deterrent this fall season to new system sales. Existing owners, long the strongest source of new-system sale leads through referrals, 'warning friends' of notices appearing on CNN, ESPN, and others. Consumer press, meanwhile, continues to be force-fed news stories from HBO (et al) warning of impending scrambling.

EXPANDED C band 'bandwidth' was final decision coming from World Administrative Radio Conference (WARC). Frequency band 4.5 to 4.8 GHz set aside for additional satellite downlink use in future. Move means that if and when new bands are pressed into service (primarily by lesser developed nations), C band receivers will need to tune 3.7-4.2 plus 4.5 to 4.8 GHz. LNA/LNBs and feeds will also require considerable modification(s).

Ku bands were also widened by WARC agreement; expansions include 10.7 to 10.95 and 11.2 to 11.45 GHz. Most felt, however, that wider Ku bands would not be used for decades.

MUSICBOX, English MTV-like service now available to Belgium cable households, expecting to hit 750,000 such homes by end of year. English Sky Channel, previously available in Belgium, experiencing similar growth.

TURNER European News Channel launch in Europe getting good but cautious reviews in European press. WPN (World Public News), out of Belgium, is now 6.5 hours per day on Eutelsat F1 attempting to be European based competitor, runs 'news' in 13 minute groups followed by 2 minute headline updates.

SPACE hopes 'Town-Net' program will establish TVRO industry as broadly based, public-spirited group. Concept is to establish downlinks at permanent school sites in all 50 states (through donation of terminals from industry suppliers) and to arrange for uplink time in Washington to allow legislators to speak directly (or via two-way telephone talkback) to their constituents. Uniden has pledged initial support.

THAILAND, long rumoured to be in marketplace to acquire salvaged Palapa-B C band satellite, may still be interested; but not for

normal use. Apparently Thai military establishment would use satellite to exclusion of commercial interests.

PanAmSat has received approval from European Space Agency for use of Ariane 4 'demonstration flight' for launch of PanAmSat bird in June 1986.

Luxembourg firm called SES has agreed to purchase pair of Ku band birds from RCA with likely launch dates in 1987. Satellites would be 45/50 watts per transponder, 16 channels on board and first 'quasi-DBS' service available throughout Europe.

SENATOR Barry Goldwater has lashed out at CNN and other programmers attempting to collect high home viewing fees. Goldwater is also urging home TVRO viewers to 'ignore CNN (et al) requests for subscription money' until such time as (there has been) 'negotiation between the programmer and some representative body of the home antenna audience.' Copies of Goldwater's letter to CNN, suitable for framing in dealer showrooms perhaps, available from SPACE (300 N. Washington St., Suite 310, Alexandria, VA 22314; 703/549-6990).

INTELSAT approved CNN use of Gorizont 7 (Russian) satellite (14 west), agreeing that CNN use would impact 'slight economic harm' to Intelsat revenues. Also approved use of four US domestic satellites for 'transfer' of information to Latin America and Caribbean, and exchange of transmissions on either US or Mexican domestic satellites between two countries.

FNN's non-business hour use by sporting interests increasing (F3R, TR4). Boxing, wrestling and 'sports handicapping' have been added to off-hours program line-up.

FILMNET, a Dutch pay-TV service on ECS-1 Ku band, is expanding into limited Dutch cable systems and is feeding selected movies to an experimental Danish STV station via satellite. Service has had low penetration rates (under 5%) to date in Belgium.

DOLLAR comparison. Belgium company specializing in TVRO systems for cable firms (Gillam Company, Leige) charges \$6K (US) for a 3.7 meter aluminum dish, mount, LNB, and single demodulator. The receiver is equipped with three separate audio demods to handle multiple language feeds of many European Ku band services. Price is for turnkey installation.

NEW JERSEY SMATV firms with 'exclusive contracts' to provide wired television services must now face competition from local cable firms. US District court has ruled contracts between SMATV and development owners are invalid if the contracts restrict cable firms from entering property and also offering their services. New Jersey has a 'Mandatory Access Law' which requires developers to allow cable and utility firms onto property if they so desire.

AUSSAT 3 satellite, scheduled for launch next August and to be positioned at 164 east, is being modified to provide 'regional service' throughout the southwestern Pacific. New bird configuration will use Ku band to provide telephone and television services 'under contract' to nations away from Australia although with relatively low power of satellite, sizeable Ku band antennas are likely (over 4.5 meters in diameter).

WEST GERMAN program service called MusicBox (not same as UK 'Musicbox') has signed agreement to lease Intelsat V Ku band half transponder to feed programming to European cable firms. Four other cable-related programmers are also using half transponders on same Intelsat bird at 27.5 west.

FRENCH talking about launch by Christmas of Nouvelle Television (NTV), a 'private movie channel' to be carried on French Telecom (1) satellite Ku band service. Another 'current French plan' would import North American TV programming via Telecom 1 satellite at C band but distribute it over western Europe on Ku band. Final 'French plan' for the month involves taking all three French national TV service channels up on same Telecom 1 satellite for redistribution throughout western Europe. With T-1 boresight and 20 watt power, dishes down to 1 meter in size would be adequate.

IRISH DBS project, long under study, shaping up with announce-

ment that Hughes will supply Ku band birds to consortium. Two birds, each capable of covering eastern half of North America as well as Europe, are planned.

SKYBRIDGE is a new truck-based 2.4 meter Ku band uplink system created by Comsat General for TV broadcaster remotes. System will allow broadcaster to beam into virtually any available Ku band satellite from any place within USA.

CANADA will release requests for quotations for next generation of satellites in 1985; present system of 3 Ku, 2 C band would be replaced with hybrid (dual band) birds. One C band and one Ku are to tally 'spare' at the present time.

NEXT Space dealer certification classes scheduled for January 24-25-26. Locations where satellite delivered classes will be available and subject matter to be taught not yet determined.

R.L. DRAKE's introduction of their 'Black Widow' TVRO system line in Nashville was intended to appeal to the sophisticated 'do-it-yourselfer' according to the firm. A six foot system with 'fixed patio' or polar mount, prepared cables and self-install instructions are included in the package line and expansion panels for upgrading to an 8 foot antenna are available.

COMPRESSION technique video conferencing has been inaugurated within Europe, with initial service between the UK and Germany. Video compression reduces bandwidth required for (slow) full motion color to approximately 3% of a full video transponder (less than 1 MHz of bandwidth). British Telecom designed the system, and a North American version will be available.

FRENCH firm Thomson-CSF still maintaining it was not its controversial high power TWTA amplifier tube which failed in Japanese BS-2A satellite this past spring. Bird lost two of three 100 watt tubes and Japanese canceled extensive Ku band market testing and program testing as result. Thomson-CSF maintains failure was related to 'overheating of TWTA gun,' an inner-tube element essential to operation of tube. Finger of suspicion points at General Electric/Toshiba who created power supply for TWTA and gun element.

WESTAR 6S, replacement for satellite lost (but subsequently recovered) in low earth orbit will have 'enhanced coverage for Caribbean' according to FCC approval.

TWO-DEGREE spacing problems are being met head on by a Western Union group made up of users of Westar satellites. Group is meeting to discuss problems already encountered with under 3 degree spacing(s) and will advise FCC on results of tests and experiments.

NEXT industry trade show will be Las Vegas, Nevada, February 19-20-21; a joint show of SPACE and STTI. Rick Schneringer, principal owner of STTI, taking up full-time residence in Las Vegas after five years in Oklahoma.

SEARS-ROEBUCK reported testing home TVRO system selling in two unidentified 'test markets.' One store is handling the Janeil line system while second is handling Channel Master package. Montgomery-Wards tried similar test, in 150 stores, two years ago using Winegard equipment.

DOOR-to-door merchandiser Amway is pushing six foot systems through catalog at just under \$1,000 each. Systems use Winegard antenna, several receiver packages including one from Automation Techniques. Program has been hampered by tardy hardware delivery from key suppliers and was running below expectations in mid-October because of product shortages.

FIRST Japanese domestic satellites, in consortium 30% owned by Hughes and 40% owned by C. Itoh, will launch December of 1987 and May of 1988, using American space Shuttle.

REUTERS is developing 'paper-model' European news channel for distribution on satellite throughout Europe. Reuters acquired majority ownership in Visnews service recently, leading to speculation that it plans to go head-to-head with Ted Turner's ENC in Europe.

SHOWTIME backed up and decided it would ship M/A-Com de-

scramblers to its affiliates and begin testing M/A-Com scrambling system after all. Firm had said in September it would hold off making irreversible decision concerning scrambling 'technique' until after NCTA quit wrestling with problem.

JAPAN's BS-3 satellite, three transponders in 120 watt class, will launch in 1990 if NEC and probable partner RCA can meet schedule. NEC won contract against Toshiba, possibly because first two Toshiba—contracted BS-2 birds failed in orbit.

LEADING TVRO OEMs Uniden and STS are actively exploring radical changes in product distribution system for 1986. Both firms have been 'hearing' disgruntled dealers complain about 'loose product distribution' and both feel they must have solid, committed dealer network to survive in face of expected competition from RCA, Zenith, and other name-brand players. STS will introduce complete home electronics system including VCR, 25" professional receiver/monitor, 4/12 GHz antenna and receiver system and novel self-aligning dish tracking system in February to help its authorized dealers compete more effectively with 'brand name packagers' such as RCA.

SEVENTEEN UK 'football' (soccer) games, previously not available for live television in UK, will be telecast by UK's Screensport service (ESPN look-alike). Look for spin-offs to US and Canadian sport channels as well.

SKYchannel, UK indie program service, has passed 4.5M cable home in 13 European countries; Spain is latest country added.

ANTARES Satellite, including in ownership Echosphere distributor, granted FCC permission to build Ku band DBS type satellites. Firm must show FCC 'progress' within one year for construction permit to remain valid, including firm commitment to purchase satellites from supplier(s).

TESTS conducted by and on behalf of ESP filters proved ability of filters to handle terrestrial interference carriers between 40 and 50 dB higher in level than desired satellite TV signals. Tests were conducted within shadow of terrestrial (AT&T) microwave tower.

A-SAT test in September, 'proving ability of US' to seek out and destroy in-orbit satellite may have mis-cued in spite of glowing reports of success. The satellite destroyed was later identified as Solwind, created to detect and measure data from sun's surface. Department of Defense labeled satellite as 'burned out' and 'useless' but scientific community reports bird was transmitting data normally...until day of test. Oooooops.

FCC trying to sort out whether an encrypted TV signal is a 'broadcast signal' or a 'point-to-point private signal.' Issue affects STV (subscription television) as well as satellite transmissions and promises to be complex before sorted out.

SECOND Hughes Leasat (Syncom) satellite stopped working on major channel. Birds are leased (thus 'Leasat') to US Navy and Hughes is paid based upon complicated performance formula. Total system was to be four operational birds by this fall; only one is now operational.

FEDERAL Express has given OK to M/A-Com for 'Zapmail' terminals. The 'microterminals' will use GTE Spacenet Ku band transponders and as many as 25,000 terminals are planned over next decade.

THIRD Intelsat V-A (series) satellite launched by Atlas/Centaur rocket and will be placed into service for Indian Ocean region. Bird has pair of high EIRP (32.5 dBw) beams each 5 degrees across intended for spotbeam television service (to 10' and larger TVRO dishes, possible).

NEW and revised applicants of FCC DBS grants are modifying their original proposals; SSS requested increase in transponders from 6 to 16, offset by power decrease from 230 watts to 100 watts per transponder. Application reflects improvements in ground system performance and fears that higher power (ie. 230 watt) transponders may not mature.

ATS-3, 18 years old, pressed into service from 105 west during Mexico City earthquake disaster. Bird provided emergency voice communications for Red Cross and other relief organizations.

NASA backed symposium scheduled February 3-4 near Orlando at Walt Disney Contemporary Hotel; similar NASA backed meetings will follow elsewhere in country.

AT&T downgrading use of satellite in favor of new undersea cables for North America/Europe 'run.' From 50-50 (cable versus satellite) status in 1985, AT&T forecasts cable handling over 56% by 1988, reflecting telco's desire to back away from satellite systems in favor of more conventional networking.

FCC could start charging for processing applications for construction permits and licenses by FY 1986. Agency hopes to generate nearly \$31M (US) during first year of new fee schedules.

TRANS-Atlantic videoconferencing now available through consortium consisting of French operator of Telecom (1 and 2) satellites and Videostar connections in North America. Service will use French Telecom 1 Ku band transponders (6 available) for European end, covering

virtually all of western Europe.

SINGAPORE is now receiving 'USA TODAY' newspaper direct, via satellite printing connection to printing plant in Malaysia.

M/A-Com reportedly shipping Videocipher 1 scrambling decoders to CBS television affiliates in selected markets. CBS has tested advanced grade Videocipher for more than one year, announced plans to use M/A-Com system in September (see earlier announcement, CSD for July 1, 1985).

DOW JONES will use F1R to transmit 'Wall Street Journal Radio Network' to affiliates, using digital modulation techniques, starting 1 January.

LAWSUITS between suppliers of TVRO hardware and distributors/other suppliers now total more than \$450M in claimed damages. Many will come to court in mid-1986 but dispute between Luxor and STA could be heard as early as spring.

COOP/ continued from page 6

ment systems report the audience for **Miami Vice** is 'up one point,' that means that the people who carry the program can now ask for (and get) an increase in the dollars they charge for commercials within (and adjacent to) Miami Vice. Similarly a drop of a share point will see the advertising rates turn down.

If every home in America was capable of being polled instantly, the advertisers would have a powerful tool that would allow them to pay for just the number of homes they actually did reach. That could be done on a weekly (per show) basis. There is no such system now and there is not likely to be. So as the diary and electronic measurement firms 'sample' those few thousand homes each week, there are averages and trends developed. Every few months those trends and averages are studied and the programming distribution firms (ie. networks) and advertisers come to some program by program accord on what the true value of the commercial time is. They arrive at these dollar numbers by taking the best estimates of the total audience for particular shows and applying some 'standard' cost to reach a thousand (million) home formula. In other words, for every 1000 (1,000,000) homes reached, there is a per-thousand (million) rate for advertising.

Thus there is a great deal of 'faith' (As Jim Bunker would say, "Faith and you gotta believe..."), in the **integrity** of the measurement systems. But down deep, nobody expects the systems to be very precise.

Life was pretty simple for the sampling-measurement people through the start of the 70s. Then cable hit the bigger cities and the viewing choices for cable viewers mushroomed. That's when HBO started to show up as a minor but growing force in the viewing 'share' business. Eventually the measurement people adapted to the inroads of cable by creating different survey or measurement systems for different 'classes' of viewers.

Homes, to be a part of the surveys, are chosen by the most random of systems. **Arbitron** simply selects their few thousand homes, on a week by week basis, by rotating through all of the residential telephone numbers in the USA. The chances you will get called and asked if you will help them measure TV viewing for a given week is very small; less than 1 chance in 1,500 or so **each year**. When they called my Fort Lauderdale telephone number just one year ago to ask me to help them with their survey, you could have knocked me over with a feather. I said of course I would and in a few days I received a packet of materials in the mail and a crisp, new \$1 bill as a 'reward' for my help. I didn't return the survey that week because it was a week when I was not in Fort Lauderdale.

"Do you have cable television?" the bright young lady asked. I said I did. "Then you will receive the cable television survey

Here's Your Chance to Make Your Voice Heard in an Actual TV "Rating" Survey.

First, write down all programs actually watched during the week beginning Wednesday, November 21, 1984

Then, complete the questionnaire at the back of the diary and mail it on or after Wednesday, November 28, 1984. Postage has been paid.

We'll feed your diary into our computer...

...to find out how many people watch each program.

With this information, TV programmers can plan more popular shows...

... thanks to helpful people like you!

We hope you enjoy the survey. Sincerely,
TED Shaker
Theodore F. Shaker, President

© 1984 Arbitron-Edgemoor Company

LIFT THIS PAGE TO BEGIN YOUR DIARY

3 Write down what you watch.

Set off on? Mark an "X" and lines to show how long.

If set is on for five minutes or more, please tell us what you're watching...

Channel Number From the dial or button you use. Use lines if channel stays the same.

Call Letters/Channel Identification Write in call letters or channel name.

Name of Program

People watching: Mark an "X" and draw a line to show how long they watched or listened.

Set off all day? Check (✓) the box at the bottom of the "Evening" page.

Your diary begins on the next page...

Puzzled? See last page.

Channel	Program	Start	Stop	People watching
40	JIM BECKY	7:00	7:30	
33	WADT GOOD DAYS	7:30	8:00	
12	KABS NIGHTLY NEWS	8:00	8:30	
33	WADT GOOD DAYS	8:30	9:00	
GA	HTO DISTANT GALAXIES	9:00	9:30	

ARBITRON SURVEY BOOK instructions tell the television viewer how to record what they watch and why their project is important to 'America.'

form," she responded, and it was plain that she knew from her computer where I lived to the street and which cable service (and what programming that service offered) I subscribe to.

A.C. Neilsen is another research firm. Where Arbitron uses a TV set 'diary' technique (one written diary for each of the TV sets in the home for the week; I said I had two TV sets because I wanted duplicate diaries anyhow), Neilsen takes another approach; they place an electronic box in your home which somehow monitors the TV channel you are tuned to and records the channel you are watching. Both firms make the obvious claims for their respective systems; Arbitron says

that just because a TV set is tuned to channel 2 for an hour is not proof **somebody** is sitting there **watching** the TV. When you fill out their diary the emphasis is on programs you 'watch'; not tune in.

Nielsen says that people forget to complete their diary and then forget which programs they did watch. Nielsen also says that they are much faster in compiling their data because it is already semi-compiled by the memory system inside of the box. They interrogate the boxes via telephone and the box 'dumps' memory into the A.C. Nielsen computer in Florida.

Nothing I can add here will do much for Arbitron or Nielsen (there are a few others as well, but none are very well known). Each will have to fight it out in the marketplace with the other(s) and in truth the networks **use both** as a check on one another since most people are pretty nervous about **sampling** 1,200 or 2,000 homes and expanding that into an **80,000,000 home universe** anyhow; regardless of the technology employed.

A.C. Nielsen, being so electronic with their approach, is now studying how home TVROs might fit into this whole scenario. That should not surprise you since we are all now aware that home TVRO users watch more television, on the average, and their choices are virtually unlimited.

Nielsen and Arbitron, in making their random calls, are starting to turn up people who have dish systems. "Do you have cable?" the lady asks. "**No, I have my own dish,**" the user replies. Neither Nielsen nor Arbitron are ready for that yet. But Nielsen is working on it.

TVRO dealer **Rick Towers**, handling the satellite part of the 'Jersey Jim Towers' TV retail firm in **Clearwater, Florida**, sold the A.C. Nielsen firm their first satellite dish. Rick has been retailing TVRO systems for about as long as anyone in the USA and his family firm is one of the largest retailers of television, stereo and VCR type equipment in Florida, if not the United States. Rick runs a first class shop; the kind

that those publications who profile TVRO dealers should investigate. A delightful segment of the overall TV showroom is dedicated to satellite TV; the TVRO branch (which also does MATV and SMATV system



JERSEY JIM TOWERS covers all of the populous west coast area of Florida with a fleet of service trucks equipped with every imaginable test and service aid for TVRO; very impressive indeed.

installations and routine contract maintenance) has a fleet of service vehicles and satellite-dedicated installers and service people. Rick has an extremely low personnel turn over; he attributes this to the way he treats his people and addresses the professionalism he believes the business warrants.

The A.C. Nielsen installation was a 12 foot Paracclipse dish mounted on the roof of their building. The multiple-story building has a

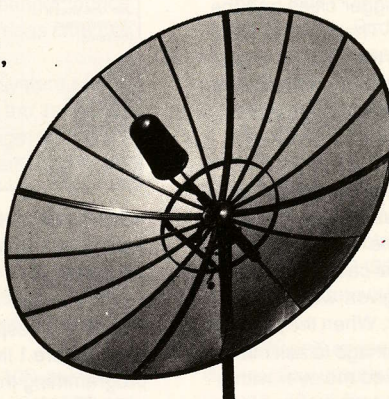
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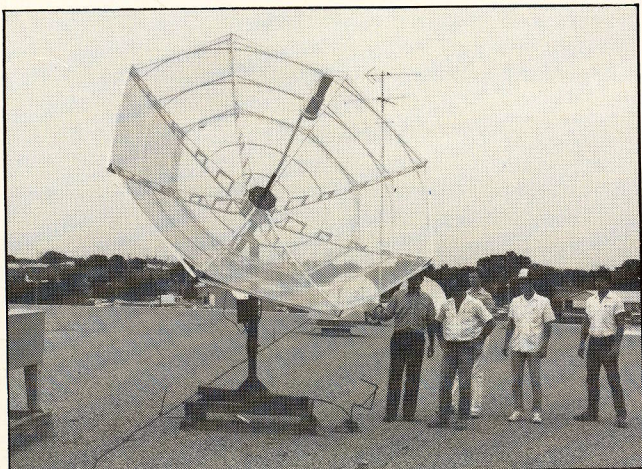
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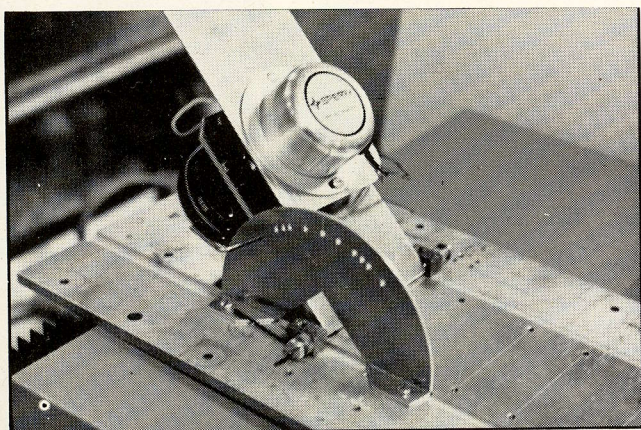
flat roof and this provided Rick with an excellent look angle above the trees and other buildings in the area. An expansive cable TV headend is just behind the Nielsen building and it is of course loaded with its own dish farm.



ON THE ROOF/Tower's installation of 12 foot Paraclipse rises above faintly visible cable firm's 30 foot monsters (center, through mesh dish surface).

When I visited the Nielsen installation, their engineering staff, headed up by one **Paul Kempter**, was working on an electronic plus mechanical system they wanted to be able to retrofit to the satellite dish systems at consumer homes one day. The concept is this:

- 1) It is no trick for Nielsen to electronically monitor and record which transponder the viewer is watching, but the problem is **which satellite?**
- 2) From the Nielsen perspective, each satellite is the equivalent of a 'separate cable system' feeding into the home, and they are going to need some automatic way of knowing which satellite the dish is pointed at in addition to 'which transponder.'



CRUDE MECHANICAL GADGET developed and being tested by A.C. Nielsen is forerunner of dish-tracking-monitoring system which will be a part of Nielsen's recording of home viewing habits.

We talked about this and they showed me a rough mechanical-optical gadget they had been testing. I pointed out that the receiver's LED counters were voltage driven and perhaps there would be a way to monitor that voltage from the receiver display circuitry to simply 'tap

into' the antenna pointing data they required.

Nielsen likes to walk into a home with a stand-alone electronic package which causes as little interruption to normal TV viewing habits as possible. Arbitron with their write-it-down diary would have to be considered about the maximum level of viewer disturbance since the cooperating home is having to 'log' each program they watch, who watched it, plus the age and sex of the viewer. That may seem like fun for a few days but before the week is out, I bet many people cease their diligence.

The Nielsen installation is pretty unique because it has to interface with their considerable laboratory and computer 'power.' The firm maintains an extensive electronic research staff on premises as well as an equally extensive computer operations and maintenance staff. I was pretty impressed with the amount of technology being employed to 'simply' check-up on what people watch on television.

All of this told me that because of the very big bucks attached to television 'rating shares' that a firm such as Arbitron or Nielsen has a corporate responsibility to stay on the very leading edge of technology change. I'm not certain when any of this exploration work on the part of Nielsen will appear in TVRO viewer homes but 1986 seems like a reasonable time frame for the first 'testing.' I would expect, because the firm is in Florida, that the first trial homes will be close by as well. As a dealer, you will one day be asked to 'cooperate' with one or more of the media measurement firms. This will involve their asking your help in detailing the particular equipment in a customer's installation, and perhaps your help in interfacing their own hardware with the existing system. Be prepared to help, and to learn a great deal in the process.

SHOWTIME Flip Flop

I had a considerable amount of admiration for some of the people in the Showtime organization. Here they were, as recently as mid-September, telling HBO and NCTA and the cable MSOs **We do not believe** the selection of M/A-Com as a scrambling system defacto standard is cast in concrete yet; and so, **we will not begin scrambling tests** with Videocipher nor will we begin shipping our affiliates VC2 descramblers **until** the NCTA resolves this issue."

That took a bunch of guts because HBO has been working as a virtual 'agent of M/A-Com' to get Showtime off of dead center for several months now. The last time I spent any time with **Jim Bunker**, I said to him **"You may lose this one;** there is a great deal of pressure being brought to bear on Showtime to walk away from their contract with you and to sign with Scientific-Atlanta." Bunker stared at me across his fish dinner and twisted a glass of something liquid in his hand. Slowly.

Well, HBO got on the stick early in September and went on the offensive. Speaking before a major cable gathering, an HBO exec lashed out at Showtime for 'dragging their feet.' He came very close to telling the cable world that **IF** the scrambling thing was going to fall apart, **IF** the home TVRO guys somehow got the upper hand, **it was going to be because Showtime had dragged their feet** and failed to implement their scrambling system as they had said they would. You can imagine all of the telephone calls Showtime people must have gotten after that HBO exec's speech.

And so, within a period of ten days or less, Showtime retracted their "We will wait and see..." announcement and followed it up with a terse "We will begin scrambling tests before the end of the year, and begin shipping descramblers," (M/A-Com, of course, since that is what they had decided they would use late last year; before the 'stink' started) "very soon."

After announcing that 'scrambling is back on the track' at Showtime, the firm's CEO **Neil Austrian** then lashed back at HBO. He called the HBO statements to the cable industry **"a propaganda war"** and said "such attacks defeat our ability to do business together **productively and undermines the very foundations of our (cable) industry.**"

A year or so ago, HBO had been courting Showtime (and others) to join it in a 'scrambling consortium.' HBO had this elaborate marketing plan all worked out whereby virtually all of the premium services would scramble together, be sold together, and descramble together. The plan would offer home TVRO viewers 'all or nothing' and if your memory is good you will recall that the SPACE Board of Directors, meeting last fall in Dallas, came down very hard on that 'bundled' plan. The opposition of SPACE, and the cries of anguish which SPACE planted in Congress convinced HBO to eventually abandon the bundled 'all-or-nothing' program which had been their game plan for TVRO. CEO Austrian remembered the plan, that Showtime (he said) "had been invited into the plan by HBO." He also retorted, "HBO aborted our agreement in principle earlier this year through no fault of Showtime/The Movie Channel."

After HBO killed their plan, leaving Showtime and The Movie Channel floating in a sea of sharks without a lifeboat, S/TMC tried to go-it-alone. That didn't work, so more recently they have been trying to package together with Turner and others, **separate from HBO**. Showtime apparently honestly felt that until the much-written about NCTA sponsored consortium had reached a decision on **which scrambling system** the cable industry should favor, it would be unwise for Showtime to allow M/A-Com to start shipping units to Showtime (TMC) affiliates.

Naturally this worried M/A-Com. If a group, such as the Showtime/Turner group should favor **another scrambling system** (such as the S/A system), the M/A-Com 'defacto-standard' would be dead. Turner and the others don't have the 'Showtime problem' because they have yet to select a particular scrambling system. They have the luxury of waiting for the NCTA study to be completed and for NCTA to go ahead

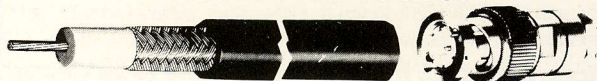
and tap some scrambling system supplier on the head with their magic wand. But Showtime, because they announced their selection of Videocipher way back in November of 1984, was in a spot. Urinate or get off the pot is what it boiled down to. When HBO started boiling the water in the Showtime pot by attacking Showtime in public, before the cable industry, there was really very little they could do **but** make the 'Oh what the hell; go ahead and start shipping the VC2 units' announcement.

Jim Bunker and M/A-Com, never to be underestimated, won the battle. They managed to talk HBO into mounting a public attack on Showtime, I suspect, and Showtime is waving the white flag of surrender. Austrian, in announcing their decision, asked that there "be an end to name calling and mud-slinging," within the cable industry.

Winning this battle may have been crucial for M/A-Com. I have heard cable programmers say, and I have often repeated, that if Showtime 'bolted from M/A-Com, it would start a wild rush to another scrambling supplier.' HBO, up to its eyeballs in investment in Videocipher, could ill-afford to be the only kid on the block using Videocipher. This all called for stiff, unpleasant and aggressive moves **against Showtime**. CEO Neil Austrian had his back to the wall and he probably didn't have any choice.

But there is a message here for the balance of the cable programmers who have yet to make a scrambling decision. If this sort of scenario could be engineered to blast Showtime into doing something their good business sense told them was a mistake, what sort of unsavory pressures might be brought to bear against the little guys like ARTS or The Weather Channel or CBN? Yup, you've got it. This is no longer a game for the inexperienced nor the wishy-washy. **We are now playing hardball** and we had better be prepared for the worst, which I believe is **yet to come**.

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SURPRISE

Not terribly long ago officials from SPACE traveled to New York City to meet with officials from HBO, and the major networks. I didn't go along because nobody invited me. And I have not talked with the people at SPACE about that visit because I usually find better ways to source out the truth when I really think it is important to know something. But I have talked with some of the people at the (TV) networks and at HBO concerning that visit.

SPACE, I suspect, wanted to be able to **say** to members of Congress **'We have tried to negotiate and talk with HBO (and the networks) on this scrambling thing and we have tried to reach an accord. We could not do so.'** That's what I suspect was their motivation in their visit(s).

It is important in this whole game to be able to display a 'willingness to deal' to those people in Congress who will ultimately be responsible for either accepting or rejecting new legislation affecting TVRO. If it looks like the TVRO industry is made up by a bunch of idiots who are hard-headed and unwilling to compromise, we don't have much stature before Congress. Hey, the whole law-making concept we function under is really an exercise where one side of an issue is trying their best to get official government sanction for **their view**. Very few laws are passed because they are **good laws**. The whole reason for laws and lobbying and spending big money with Congressional campaigns is to be able to get 'your point of view' introduced into the law hopper in the hope that **your law** will make life easier **for you** and more difficult for somebody else; preferably a business competitor. And here you thought laws were passed because they were instruments of social progress!

From what I am told, I come to the following conclusions concerning the SPACE visit with the network and HBO people:

1) HBO surprised the SPACE folks. SPACE hoped that the January 15th 'scrambling-sure-date' could be postponed. SPACE hoped that HBO would be more accommodating to the problems faced by TVRO dealers and consumers. Wrong. HBO was hard headed, reluctant to negotiate on any point, and in effect told SPACE's folks "Go away and don't bother us."

That's how I interpret the meeting.

2) The networks, meanwhile, surprised SPACE in a different way. You should be aware that the networks are now getting serious about scrambling. CBS is testing Videocipher 1; that's the super-hot-dog version of the M/A-Com system. **CSD** published a report and photographs of Videocipher 1 in operation in our **October 1983** issue. It is a mean machine. Fortunately for cable, it is also a very expensive system which would have cost HBO and cable systems a fortune to employ. ABC is now admitting an interest in a scrambling system as well. NBC is officially not pursuing it **today** but unofficially they are concerned about the eventual proliferation of 12 GHz terminals (NBC is on Ku band already, which is in itself a measure of security; CBS and ABC are opting for C band).

Well, the network visits as best I can determine went very smoothly. In effect, SPACE was told **'If you can get the Department of Justice to decide that scrambling of satellite feeds is unAmerican, we will gladly abandon our scrambling plans.'** As you are probably aware, and as we comment elsewhere in this month's 'Comments,' the DOJ is hot on the trail of alleged misdeeds perpetrated by cable programmers and cable operators. The big-time networks in effect said **'Go get 'em!!!'**

What to make of all of this?

No matter what HBO said and did during and after the SPACE visit, they were bound to lose this one. Had they agreed to postpone scrambling or something equally severe, the cable operators would have lynched them. If they stood their ground, SPACE would lose no

time reporting to Congress that HBO was 'difficult, uncooperative, and hell bent on destroying rural American folk's TV reception.' Right on.

The networks, on the other hand, could afford to be more open. Under the 1984 viewing act, the networks are under no obligation to deal with us at all. Yes, if they are bright, they will recognize that a failure to accommodate home TVRO will ultimately result in there being legislation directed at forcing them to deal with home TVRO. Next to McDonalds and Johnny Carson, nothing is more 'American' than access to the three major network service signals.

The networks are scrambling for several reasons. First of all, there have been several incidents where one network has been 'caught' stealing another network's news feeds. With prime-time news, ratings as highly dollar-sensitive as they are, losing a story on its inward bound satellite transmission to the network across town is a dollar and cents blow. **And**, the networks are starting to hear from their 200 or so affiliates that the affiliates don't like the idea of 'local viewers' tuning in the network feeds **direct**, and bypassing all of those fine, local commercials. Just like the **cable programmers** reacting to the **cable firms** when the cable firm says "We lost 24 subscribers to your service last month because 24 homes bought TVROs in our town," the networks have to at least **act sympathetic** when an affiliate reports "We have reports of people watching you direct rather than through us."

But if I was a network mogul, I would be thinking hard about the **possibility** that in, say, 10 years, 50% of American homes would have a TVRO. Now, when a network program is sent down the microwave line to 200 affiliates, all of those dollars paid for commercials are divided up between all of those affiliates. The networks pay the affiliates for carrying the programming (except in the very small markets where the stations simply get the programs free of charge). If a station has a prime-time rate of \$1,000 for 30 seconds, the networks negotiate with the affiliates for a lower rate. They do this based upon the fact that the network is supplying the programming (which has value) and the network is somehow delivering that programming (with the commercials inside) to the switcher bay at the TV station. The average, nationwide, the last time I checked was that the networks pay about 30 cents on a dollar; a commercial that would have sold for \$1,000 if bought by a **local advertiser** ends up costing the network \$300 when he negotiates with the affiliate station. Don't cry for the affiliates just yet; think of how many \$300 (30%) checks they get for a single evening's programming and **how little they do** between 8 PM and 11 PM (or however prime time falls in your area) to keep the station running.

So let's say 50% of Americans owned a TVRO. That means 50% of America could in fact be served **network-direct**. If every station in the country lost exactly 50% of its viewing audience to network-direct, the network could now say to the station "We will pay you \$150 for that 30 second spot period because your audience is down 50%." They already do this on a station by station basis. When they negotiate the actual rate for spots with the affiliates, the station's coverage, cable carriage, and general competitive position enters into the computation. That's why stations spend such big bucks on 1,200 foot towers and maximum power transmitters; they have to be in a position to **demand** the **highest possible rate** for their network-originated spots. Even a 1% difference (\$10 on a \$1,000 spot) adds up very quickly when you multiply the number of spots run per day (week, month) times that 1% differential.

If the networks could save 50% of that 30% they are paying the local affiliates, they'd pocket a huge amount of additional money each year. Yup, there is a neat financial incentive here which **favours** the networks going **directly** to the American TVRO viewers. Forget those 1,000,000 or even 3,000,000 additional homes they might reach via satellite because they are simply out of reach of terrestrial affiliates. **That's peanuts.** The big bucks here are when the networks can **bypass the affiliates totally!**

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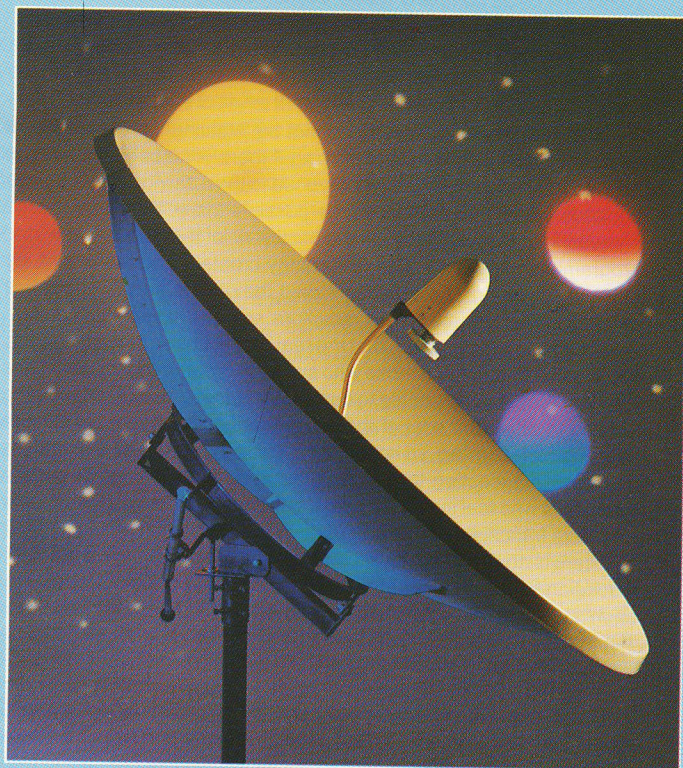
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to fall for this; they didn't get into a position where single TV stations sell for as much as \$500M (that's \$500,000,000) **because they were dumb** business people drinking Martinis 24 hours a day. The network affiliates may not be totally focusing on TVRO as a threat **yet**, but that day **will eventually come** and when it does, our 'battles with cable TV' will be best remembered as mild foreplay. Right now, the forward thinking network types are watching our growth very carefully and wondering how long it is going to take us to reach 'critical mass.'

They would love to have us watching them, 'network-direct.' They'd love to be able to start shaving percentages off of affiliate checks for viewers 'lost' to 'network-direct.' But they can't **say** that, they can't **act like that** in public, they can't even **intimate that**. And most of all, they would love to have somebody such as the Department of Justice (that's **THE** Department of Justice) telling them **'You shall NOT scramble,'** or a second choice, **'If you scramble, you SHALL make your service available** to TVRO in some fairly marketed unscrambled fashion.'

SPACE **might** one day get somebody such as Senator Gore to introduce legislation into Congress which would seek to force the networks to offer their service directly to TVRO viewers. Such a bill would never (repeat, **never**) stand any chance of passing. Why?

The Congress depends totally upon their state or district TV (and radio) stations for 'communication' with their constituents. How long do you think it would take the owner of a powerful network VHF station in Tennessee to convince Senator Gore that he would be 'wise' to **not support** any legislation which allowed TVRO viewers to bypass **that affiliate station** in favor of 'network-direct'? About as long as it took the Senator to remember the last time he got crossways to that particular station, he ended up right after the American Anthem with his important interview; at 3:10 AM.

No, we'd never win that one. We'd never (never being forever) win with a bill that put the powerful network TV **affiliates** into a competitive disadvantage position. Remember why laws are passed?

But on the other hand, the Department of Justice is less prone to TV station pressure, and relatively insulated from such retaliation. So the best and perhaps only way for the networks to end up saying 'Hey, **we have no choice**; we have been **TOLD** that **we must** offer our services to home TVROs, is for the DOJ to come down early (like in the next few years, **before** we amount to much) establishing our 'right to plug into' the 'network-direct' signals. Ultimately, that would make the networks a ton of money and while they could never **admit** they like it, secretly they would love it.

So SPACE met with HBO and got a cool response and they met with the networks and got the encouragement to have the DOJ proceed with full speed. I am not surprised and after they think about the whole picture, I doubt anyone else will be either.

ANOTHER SCRAMBLING Concept

My mail bag usually overflows with reports, questions, and on that rare Monday, a good idea which may even on the surface be 'new.' A tip of my hat to **Don Sheff**, President of something called (the) New York Institute of Photography in New York City for one of the latter.

Sheff does not have a TVRO but he is in the process of buying one. I hope he doesn't plan to install it at the East 43rd Street address shown on his letterhead. He comes to us from an article I wrote for one of the consumer TVRO magazines recently.

Sheff suggests that since it is pressure from the cable TV **programmers** and the cable TV system **operators** that is forcing this scrambling program into high gear, a compromise which he feels might be acceptable to both sides is in order. For a consumer with no dish, he shows considerable insight into the nature of the battle going on.

The compromise would work like this:

- 1) **Where there are cable service lines in place**, if a person

opted to purchase a TVRO, the home buying the TVRO would (by legislation perhaps) automatically have to pay to the cable TV company (serving his area) a monthly service fee equal to **the percentage** of the full cable fee which translates to satellite delivered signals. Say the cable served home **could have** HBO, Cinemax, CNN, ESPN, WTBS, WGN and the Weather Channel. And out of a total cable bill for **all services** of \$30.00, it was apparent that \$16.60 was for the just-listed program channels.

Sheff suggests that the cable company be allowed to collect that \$16.60 just as if the TVRO owner was taking cable **but only paying for those particular channels**. Since the home is not actually taking cable, it would not pay the full \$30 that cable subscribers would pay; it would only pay for those **satellite delivered** channels which the cable company actually carried.

This would mean that the cable company would never totally 'lose' when a home opted for TVRO versus cable; even if the home had never taken cable and was therefore not dropping cable in favor of TVRO, the cable company would 'net something' for the TVRO.

- 2) Now, where there are no cable lines in place (at the time the person bought the TVRO) **that family would pay nothing**. To anyone.

The theory here is that you cannot be 'stealing' or 'using without payment' cable created programming if there is no cable where you live. Nobody is losing income or revenue to the rural non-cable homes because there is no cable revenue possible there. **Why not charge something anyhow?** Because the backbone of the satellite delivered programming is the satellite technology created, and advanced, **by taxpayer money**. The rural folks paid their taxes and through their satellite dishes, they are able to 'recapture' some of that tax investment.

Sheff is suggesting here that the real battle is over 'property rights,' cable programmers and those who supply programming to cable firms feel they are allowing people to use their services who are contributing nothing to offset the cost of the programming. But the real pressure today is **not coming** so much from the programmers themselves (HBO is an exception to that statement) but rather from **the cable operators** who feel they have paid for some type of 'exclusive' or 'near exclusive franchise-distribution right' to the programming.

There is no totally equitable solution to the scrambling wars. In any resolution to this problem, **there will have to be compromising**, and **each side will have to give up something** to find a more or less 'happy middle ground.' Sheff may be onto the right type of middle ground.

If the cable operators could not lose money when a TVRO went into their area, and in fact if they took in some from non-subscribing TVRO owners who had never subscribed to cable, they would be ahead. Rural folks, those who have no cable available, on the other hand, are justifiably angry when they see their city-cousins with cable services available and then are told that if they want to invest \$2,000 or \$4,000 for the equipment to get the same services, they can expect to pay from 35% to 1,000% **more** for the same services as those city-cousins. There is nothing fair about that.

Cable system operators want some protection. Sheff's plan gives them protection. Cable programmers want cable system operators off their backs. This allows that to happen without scrambling.

Did I say **without scrambling**?

That's the beauty of the Sheff concept. It would be virtually impossible for someone to 'hide' a TVRO dish in a city or town. Collecting for the service would not be a problem. But wouldn't that hurt TVRO sales? Not nearly as much as disorganized scrambling, and I'll tell you why.

Let's say the in-town TVRO owner had to pay for every service the cable operator is taking off satellite, on a pro-rated basis. It

would not be at the wholesale rate (remember, we have to give up something) but rather at a pro-rated retail rate. Bad deal for the consumer? **Not really.** He pays for say 7 or even 17 signals, on a pro-rated (same as cable subscriber) basis. But, **he also gets another 100 or so services without paying for them.** If the cable system in our example carries and re-sells HBO and Cinemax, but **not Showtime and The Movie Channel**, the TVRO viewer gets Showtime and The Movie Channel for free. The ultimate beneficiaries might be the cable subscribers who are only **offered 7** of the 47 available satellite services. If a sizeable portion of the town bought TVROs, sooner or later the cable system would add these additional satellite services because it (the cable company) would want to get paid for these channels.

So does the in-town TVRO consumer lose? No, not at all. He gets what cable gets **and** he gets several times as much as well. I don't think that would make a sizeable dent in the in-town TVRO marketplace, and it would pacify the cable operators who really don't expect to get everything they want in this deal anyhow.

And the rural folks? Well, maybe all of those people who write me and the consumer magazines complaining that they have tried for five years to get the fat, dumb, and happy cable company to extend their cable lines a half mile to serve them (finally buying a TVRO as an alternative to cable) would find the cable companies newly interested in serving rural areas **around** their communities. Not all of them would get cable, certainly. In fact, **most would not.** But this could and would cause the cable firms to stop and think twice before they write off doing a 2,500 foot line extension just because they are 'only going to get' ten new homes.

The **real rural folks**, the ones who would never get cable offered to them, would continue getting service from satellites free because there would be no scrambling necessary. **No scrambling?**

I don't care what HBO and M/A-Com say; their scrambling system sucks. It may take awhile for somebody to 'beat it,' but sooner or later, somebody will. In the meantime, it is like bandaging a broken leg with a toothpick and a plastic tie wrap. The medicine does not suit the ill-

ness. And nobody else, to my knowledge, has a better or more economical or more reliable system out there today. Down deep, M/A-Com fears that the world opinion will come to this realization. Down deep, M/A-Com lives in fear that 'the tide will turn' and people will come to their senses and say 'Hey, wait a minute. What the hell are we **REALLY** doing here???' Marrying the entire satellite system to a **first generation scrambling system** which we will be forced, for economic reasons, to use for 5 or 10 or 15 years makes no sense at all.

Taylor Howard said it best (although I doubt he thought of it first); **"My closet is filled with yesterday's electronic technology; one hour Beta format video recorders, two hour VHS format recorders, Video Disc players; I cannot see why the home TVRO industry should pay for the development of scrambling technology which at best must be judged as premature, immature, and likely to be surpassed in technical simplicity, ease of operation and certainly in cost within just a few years."** Bravo, Taylor.

Sheff's concept, matured by my typewriter of course, is hardly perfect. But it does suggest an alternative approach to resolving scrambling which would satisfy the major economic players in TVRO and cable. It would eliminate the need for scrambling for several years, and during that several years the entire technology of scrambling would have the luxury of maturing. The big loser here or I should say losers would be M/A-Com and HBO. Alas, they gambled by rushing in with a new technology and as Ted Turner likes to say "You can always tell the pioneers; they are the ones with arrows hanging out of their ass."

Cal Amp/Janeil

California Amplifier and Janeil Corporation have two things in common. They have both seen better days and held a higher profile in this industry. The recent purchase of Janeil by California Amplifier may prove to be a mathematical paradox—that is the sum of the parts may be greater than the whole.

Cal Amp suffered from tough competition and falling market prices of LNAs and LNBs. Janeil suffered from product credibility and reliability. Although the latest product offering from the Dushane group has greatly improved in the last year, it was probably a matter of "too-little, too late"! Janeil had, however, made serious inroads with mass merchandisers such as Circuit City, Pacific Stereo, Pace and Price Club setting up distribution and installation which required no investment or expertise by the retailer. The chain stores' sole responsibility was to sell the product and Janeil took care of warehousing, shipping, installation and warranty.

Under the new liaison Janeil Vice President Bob Dushane will head up a "Merchandising Committee" which will market all the product lines for both the Cal-Amp OEM and Military division and Janeil's retail system sales. Janeil reportedly will keep its own identity and will operate at arms length from the Cal-Amp manufacturing and OEM division.

This match up promises to do wonders for both companies combining Cal-Amp technical expertise with the Dushane family's marketing prowess. As we said before "the sum of the parts may be greater than the whole!"

Watch for more details of this marriage/purchase in next month's CSD.

ECI-11

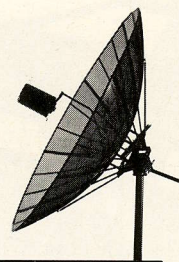
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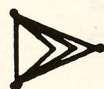
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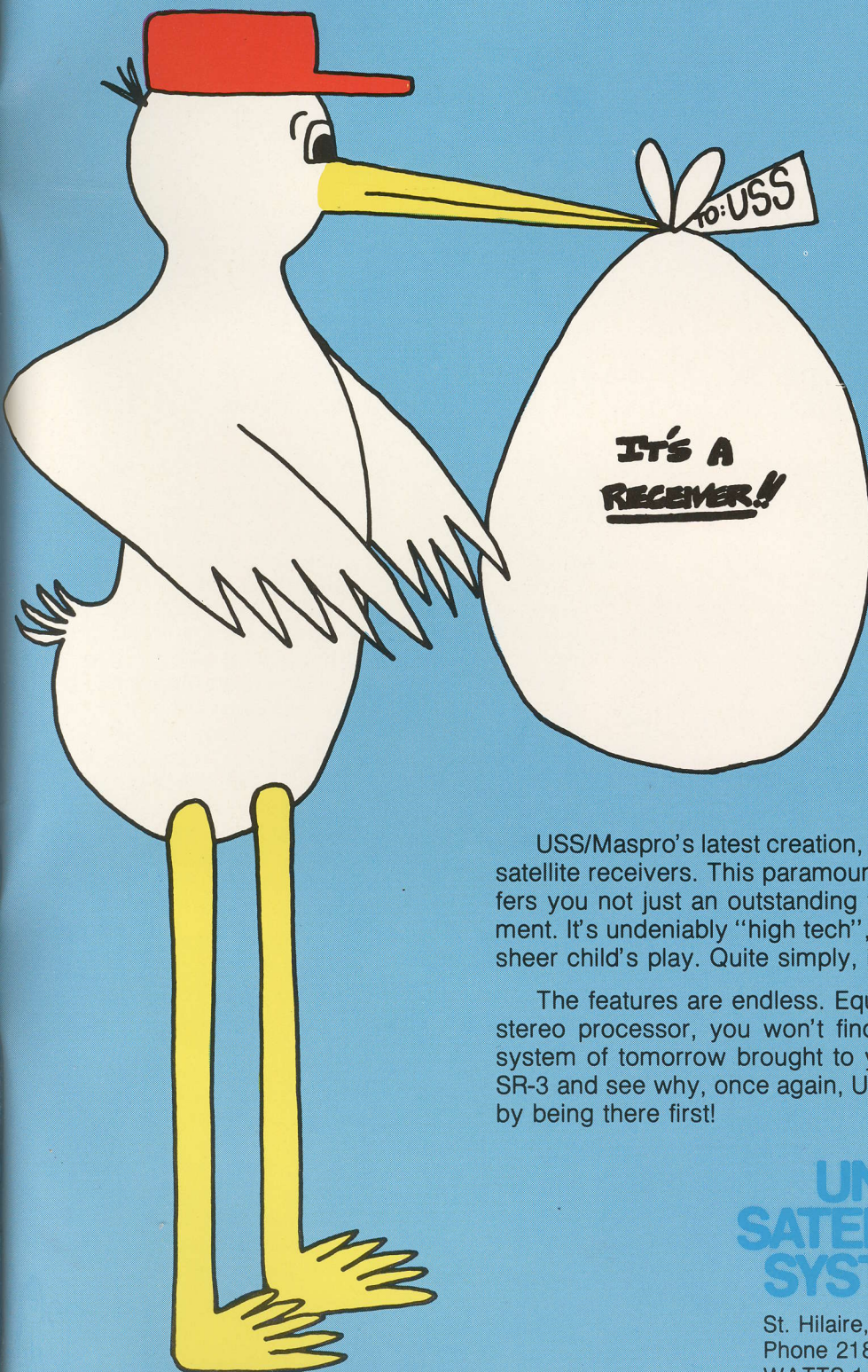
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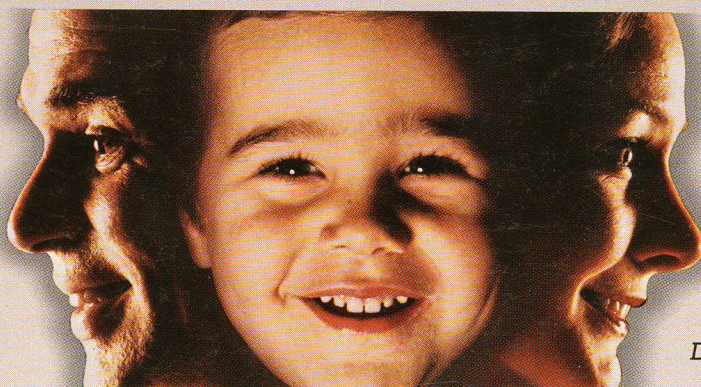
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